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ABSTRACT

Produced to provide educators and library media personnel with some understanding of and direction in the rapidly expanding field of microcomputers and their applications, this monograph includes several articles dealing specifically with media center applications and others concerned more generally with the microcomputer in educational settings. The following articles are included: (1)"The Microcomputer and the School Media Center," Vicki Sherouse; (2) "Selecting a Microcomputer for the Media Center," Vicki Sherouse; (3) "Computer Software Selection," Richard Post; (4) "Cataloging and Storing Microcomputer Materials," Kathy Kneil; (5) "Microcomputer Management," Roger Burgess; (6) "Using a Microcomputer for Media Center Administration," Vicki Sherouse; (7) "Setting Up In-Service Programs about Computers," Steven Hawley; (8) "Microcomputer Languages," Fred Williams; (9) "Troubleshooting Microcomputers," Weston Orloff; (10) "Networking: Vital Links to a Total Information System," Keith Bernhard; and (11) "Interactive Video," Richard Post. Also included are a glossary by Lenora Ferdinand, and a 12-page list of selected references about microcomputers compiled by Greg Byerly and Clara O. Jackson. (LMM)

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Microcomputers in the Media Center

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Microcomputers in the Media Center

Edited
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1983

TABLE OF CONTENTS

Foreword 1

The Microcomputer and the School Media Center — Vickie Sherouse 2

Selecting a Microcomputer for the Media Center — Vicki Sherouse 4

Computer Software Selection — Richard Post 8

Cataloging and Storing Microcomputer Materials — Kathy Kneil 13

Microcomputer Management — Roger Burgess 17

Using a Microcomputer for Media Center Administration — Vicki Sherouse 20

Setting Up In-service Programs about Computers — Steven Hawley 23

Microcomputer Languages — Fred Williams 29

Troubleshooting Microcomputers — Weston Orloff 32

Networking: Vital Links to a Total information System — Keith Bernhard 34

Interactive Video — Richard Post 39

Glossary — Lenora Ferdinand 44

Selected References about Microcomputers — Greg Byerly, Clara O. Jackson . 48

FOREWORD

Welcome to the world of microcomputing. The Computer Department of the Ohio Educational Library Media Association has produced this monograph to assist educators and especially library-media personnel in getting a handle and some directions on the rapidly expanding field of microcomputers and their applications. The monograph has been designed to be of use to both the novice and the experienced user with topics ranging from the selection and purchasing of hardware and software to troubleshooting and simple maintenance to a description of languages to the networking of microcomputers and their use in interactive video. Several articles deal specifically with applications in a media center. Others deal more generally with the microcomputer in educational settings.

The basic rationale for focusing on the microcomputer in a media center setting is our belief that the proper home for a microcomputer dedicated to instruction is in the media center where it can be accessed by students and staff in the same manner as other instructional resources.

As can be readily seen from the number of individual authors, the completion of the monograph has involved many OELMA members. Special mention needs to be made of the contributions of several including Danna Deaton as Chairperson of the OELMA Publications Committee. Her committee was responsible for taking the final draft, the photographs, and the artwork and producing this finished publication. Much of the photography is the work of Lars Lutton. The cover art was produced by Janis Miller. Both are staff members of the Ohio University Computing and Learning Services. Other photographs were supplied by Steven Hawley and Gwen Spencer. Without question, however, the greatest contribution to this monograph has come from Vicki Sherouse. As the author of several articles, as the chief editor and driving force in completion of the monograph, and as Chairperson of the OELMA Computer Department from 1980 to 1982, her tireless efforts are the chief reason for the existence of this work. Thanks Vicki.

Richard Post
Chair, OELMA Computer Department.

THE MICROCOMPUTER AND THE SCHOOL MEDIA CENTER

Vicki M. Sherouse
Westerville Schools
Westerville, Ohio

The first question that needs to be asked is: Why place microcomputers in the media center at all? In many schools today microcomputers are a ready in the building, but located in the math, science, or business departments. These are good locations for computers, for obvious reasons, but they also stereotype the equipment as having a narrow range of abilities. Placement in the school media center helps all teachers and students develop a wider mind-set about what computers can do. Another important reason for placing computers in the media center is the availability of storage for hardware, software, manuals, magazines, books, etc., in a central location. In most schools this is where all other audio-visual equipment and software are stored and made accessible for use. In reality the computer is just another piece of teaching equipment and can be handled most easily by using the same processes that have already been developed for handling audio-visual equipment. Further, the media center provides a setting which already has adult supervision available, as well as a media specialist whose background in selection of educational resources makes him or her uniquely qualified to supervise the selection and utilization of computers.

Once computers are in place in the media center, the range of uses for them is truly astounding. As an information processing tool they can be valuable for teachers, students, the media specialist, and administrators, in ways that no other educational equipment can match. The following is a brief overview of the computer's capabilities for each of these groups. For further explanation of particular uses, one can refer to other articles in this monograph or in the bibliography.

The best way to introduce teachers to the computer is to demonstrate the utility programs designed to eliminate much of the paperwork that presently interferes with teaching. Such programs include grade averaging and recording, bibliography preparation, test writing, storage and editing of questions for future use, crossword and word-find puzzle makers, readability programs for establishing reading levels of materials, word processing, and PILOT languages which allow teachers to generate their own computer lessons.

Students usually show no hesitation in the use of the computer. However, to be sure that the equipment is used productively rather than as a free video game machine, good educational programs need to be purchased. Students will then be able to use the equipment to learn programming skills, for drill and practice, tutorials in special areas, problem solving, educational games, and simulations. In special areas the computer can do some unique things. These areas would include programs for physically and mentally handicapped students, music programs which allow music composition by students who cannot play an instrument, art and graphic programs, and word processing for use in producing student writing, newspapers, or business classes.

In media center administration, the media specialist has a long list of possibilities for organizing and making more efficient media center tasks. The computer can handle all circulation or just overdues, prepare catalog cards, periodical lists, bibliographies, purchase orders, union lists, vertical file headings, library statistics, reserves, subject headings, community resource files, ready reference files, and audio-visual inventories. A microcomputer with hard disk can even replace the card catalog! Which of the above activities can actually be accomplished depends in part on monies and clerical time available. However, even in a small center, the time saved in preparing bibliographies and purchase orders alone would quickly justify the purchase of both the equipment and software necessary to do the job.

School building and central office administrators can use the microcomputer to prepare teacher and student handbooks, schedule students, route buses, prepare grade cards, score standardized tests, prepare inventories, budgets, and statistics.

Until recently, many of these tasks could only be performed on much larger computers. Now software is available to accomplish these tasks on many of the full range microcomputers such as the Apple or TRS 80.

In making the decision to add computers to the media center, the above lists of capabilities should be studied and priorities for use determined before equipment is purchased. In that way the brand of equipment will be easier to select, based on its ability to perform the needed tasks and on the availability of software for a particular machine. A computer in the school media center can thus become as integral a part of the school program as the media center itself.

SELECTING A MICROCOMPUTER FOR THE MEDIA CENTER

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The first thing that a media specialist or any other educator needs to know before purchasing computer equipment is the terminology that the salesman or catalog will use in explaining what the equipment is and what it does. The computer itself is known as the central processing unit or CPU. This is the actual brain of the computer, where calculations and logical processing of information takes place. Usually in a microcomputer the CPU and the typewriter-like keyboard are housed in the same unit.

In addition to the CPU or the computing part, the buyer also needs to purchase items which are called peripherals. These extras allow the input of information into the computer, and the output of information from the computer so that it can be used.

The keyboard itself is an input device, but to be truly useful the computer will need to be able to have access to programs that can be purchased. To put these prepurchased programs in the computer, a cassette tape recorder, a floppy disk drive, or a hard disk drive is needed. The cassette tape recorder is the least expensive way to load programs into the computer, but it is not recommended for school situations because of its slow speed and unreliability in handling data. The floppy disk drive at $350. to $550. has been the preferred method to date. The disks that hold the programs can be purchased in quantity at about $2.50 each and can be duplicated by the user to allow for back-up of important data. Another alternative if a school is purchasing several computers, is the hard disk drive at $2500. to $5000. It can be more economical since it can support multiple computers, and because its storage capability can be twenty-five times or more that of the floppy disk.

Other peripherals that may be purchased are a modem which uses a telephone line to allow computers to "talk" to each other or a graphics tablet which allows for speedy input of any graphic material.

Each computer will also have to have what is called a CRT or screen for viewing the output of the computer. Some models have this monitor built in. Some computers can use a regular black and white or color television, however, often an RR modulator at additional cost is needed to complete this hook-up. Special monitors can be purchased that do not receive television signals. With some computers these provide a more readable picture. Monitors range in price from $125. to $800.

If the computer will be used for any type of administrative use, a printer will be necessary. Thermal printers are not recommended because of the cost of the specially coated paper they require. Dot-matrix printers are quick and usually produce acceptable quality for a school setting. They range in price from $500. to $900. Noise levels should be compared between printers as this can differ a great deal. Also the printer should be able to accept single sheets of paper to allow for printing of dittos. A wide business carriage may be of advantage when the computer will be used for high school business classes or for administrative accounting. Letter quality printers are slower than dot-matrix printers and somewhat more expensive, although new models have been more competitive in price. However, schools which are considering replacing any of their electric typewriters should investigate buying one of the many which can now be hooked up to a microcomputer. This would allow letter quality printing when needed, at only a small additional expense.

Finally, if the school is planning a large classroom set of computers, the idea of the network controller should be investigated. This device works on the same principle as the language lab, allowing the teacher from her computer station to control what programs the students have access to and to also monitor student work at their individual computers. Both Radio Shack and Apple have such systems available and other computer companies have them in development.

In deciding what particular model of computer a school should purchase the following two questions appear to be the most important: How much money is there to spend? and What will the computer(s) be used to do? The following discussion divides the most frequently used educational computers into categories by cost. Prices throughout this article reflect Spring, 1983 costs. Even though such prices tend to fluctuate, they are given here to reflect the range of features available in different budget categories. Further though, the computers listed are those currently most prevalent in education; the models will, of course, change over time. However, a purchaser can easily update this list by a visit to a computer store to compare the same kinds of features as listed below to those on the newer machines.

Among the least expensive computers are two types which sell for between $100. and $200. These would be appropriate for teaching programming. At $100. the Sinclair-Timex is a reliable computer that can use a regular T.V. and cassette tape recorder. Its 4K memory can be expanded to 64K (though in a limited manner). It has a membrane type keyboard which might be of additional value in an elementary school setting. Also available in this price range are pocket computers manufactured by Radio Shack, Panasonic, Sharp, and others. These low cost computers look like large calculators but have true computer capabilities.

In the inexpensive range, a school can purchase computers that can be used to teach programming and will also be able to do some computer assisted instruction. Computer assisted instruction of the drill and practice nature, short tutorials, and uncomplicated simulations, are available for all of the following computers. However, because of their limited memory sizes and some other technical considerations, many of the more sophisticated CAI programs cannot be written for these machines. The price range of these computers is from $200. to $300. including discounts. The following is a list with some of the more important educational features indicated:

Commodore Vic 20

Requires special cassette recorder, 4K to 32K memory, color, sound, graphics, 22 character display width (very narrow)

Texas Instruments 99/4a

16K to 48K memory, color, sound, speech generation, graphics, LOGO language available

Atari 400

Requires special cassette recorder, 16K to 48K memory, color, sound, graphics; flat, membrane keyboard (may be a distraction for data input), Minnesota Educational Computing Consortium software available

Sinclair Timex Spectrum

16K to 48K memory, color, sound, graphics, low cost peripherials planned ($88. disk drive)

Radio Shack Color Computer

16K to 32K memory, color, sound, graphics

In the price range of the most expensive microcomputers, the models and companies expand enormously. For this article the selections have been limited to those computers which have been aimed at the educational market and have educational software currently being produced for them. In this price range a school can find computers that will be able to be used for teaching programming, computer assisted instruction, computer based instruction (where an entire course or section of a course is computer taught), or administration purposes. Packages have been developed for some of these computers which can schedule students, print grade cards, generate purchase orders, etc.; administrative programs which until recently could only be performed on much larger computer systems. In this price range too there is presently a great deal of new activity in announcing "Third Generation" equipment. Schools should, of course, be aware that computer technology is constantly being upgrad-

ed; however, purchases can still be made today knowing that the equipment purchased now will be able to be utilized for many important tasks even if something in the future is invented that can do some things faster or better.

Commodore Super Pet

$1895. with built-in monitor, 48K memory, no color, no sound. five programming languages included

Commodore 64

$595. 64K memory, color, sound, graphics, can run most Pet programs. Software has been announced that will allow this model to run some of the Atari, Apple, and TRS 80 programs

Atari 800

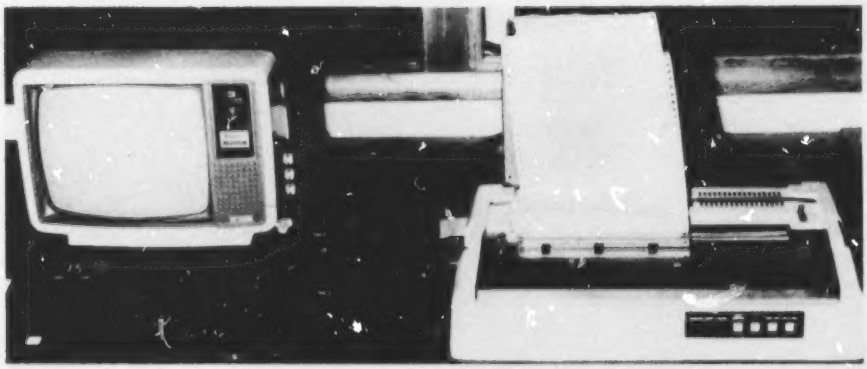
$700. with built-in TV hook-up, 48K, color, sound, graphics, designed to be very easy to operate, supported by MECC software

Atari 1200XL

$895. 64K memory, enhanced color, enhanced sound, graphics. Atari is aiming for 100% software compatability with the 400/800 models. A plug-in cartridge allows word processing without a disk drive.

Radio Shack TRS 80 Model III

$1850. with built-in monitor and 1 disk drive, 48K memory, no color, no sound, no video output (cannot connect additional TV for demonstrations), extensive educational software



Apple IIe

$1150. 64K memory, color, sound, graphics, speech synthesis, LOGO language, supported by MECC software, extensive educational software available, extensive peripherals

Bell and Howell Apple

$1350. Same model as Apple IIe, plus educational module which includes: earphone jack, dual video outputs, speaker output, three electrical outlets

In making the decision about which category to choose from price will probably be a major consideration. In deciding among the different models within a given price range the following questions should be considered:

1. What programs do you want now? On which computer do they work?
2. What likelihood is there of continued good educational programs for this computer?
3. What computer has the publisher of your textbook series adopted?
4. What local support is available?
   Faculty and staff?
   Nearby schools?
   Educational expertise of local computer store?
5. Features, durability, warranty, service languages available, noise factors, cords needed?
6. Ability to interface with larger computers?

Finally, in deciding how to spend the computer dollars available in the district, remember that money must be budgeted for the following items: carts or tables, programming, in-service training, repairs, disks, magazines, books, electrical outlets, and computer associations. If these areas are neglected then the success of any equipment purchase, no matter how wise, will be jeopardized.

COMPUTER SOFTWARE SELECTION

Richard Post
Ohio University Computing
and Learning Services

Most educators and library-media specialists are reasonably adept at selecting software (information and packaged instructional materials) when that software is in traditional forms such as books, filmstrips, periodicals, and tape.

In the last several years, a new format has become cost-effective for use by educators. The circuitry of the electronic computer, whose lifespan traces back less than forty years, has been reduced to pencil-eraser size. When equipped with a keyboard, memory, and other necessary supporting circuitry, the resulting microcomputer is still small in size and price but large in capabilities. Selecting the software, the sets of instructions that make the computer do useful tasks, is somewhat more complicated, however. Not only does the educator have to be concerned with administrative or instructional effectiveness, but also with special computer hardware and operating system factors.

What are some guidelines for selecting usable microcomputer software? Obviously all of the factors necessary for good design in instructional media in general also apply to computerized instructional materials. Many of those factors also apply to software for administrative use.

Meeting the need

The first and most important question to be asked of any software product, whether computer software or other instructional media, is does it meet your specific needs? For administrative uses, can the software actually do what you had originally planned for it to do? For instructional uses, are the objectives or competencies to be achieved by the student through microcomputer software appropriate to curricular needs? For that matter, are objectives, goals or competencies even available or readily apparent within the supporting materials?

Educators should expect clearly stated goals and objectives to accompany all instructional software. A number of publishers provide such information. Some software producers, especially those with less experience in producing for educational markets, simply ignore this important guideline.

Grade and skill level

In a similar vein for instructional software, the next most important concern is the intended grade level of the subject content of the software. Are the grade and content or concept-difficulty levels realistic?

Some publishers allow students to branch to different skill levels which may contain similar content but the conceptual levels, pacing, depth, and vocabulary usage are distinct at each skill level. Such an approach allows students of different grade levels to use the material appropriately.

Design structure

For instructional use, it is important to determine whether the software is largely structured as drill and practice, as a linear or branched programmed learning sequence, or possibly as a simulation or simulation game. Drill and practice routines may bore some students very quickly. A simulation or simulation game is a model of a real-life situation and tends to hold the students' interest even though it may incorporate some drill features. One interesting example is a simulation of a nuclear reactor. The reactor is shown graphically on the monitor screen. The student controls its operation and thereby learns the functions and component parts of a reactor. Mistakes in operation may result in a simulated "melt-down".

Programmed learning sequences can be teacher-designed using one of several computer-assisted instructional authoring packages such as the Bell and Howell "Genis" software. Good programmed learning sequences with proper levels of feedback and positive, varied reinforcement for the student require fairly sophisticated instructional design skills although computer skill requirements are minimized by the authoring packages.

Commercial linear and branched programmed learning and simulations or simulation games typically require more time and skill in authoring than drill and practice and, as a result, may cost more. The greater student interest may very well be worth the extra cost.

Graphics and color

Detailed color graphics also cost more to produce, but they also typically result in greater student interest especially if the graphics and some limited animation are used to reward correct answers. Of course, the technique can be overdone, but part of the appeal of the microcomputer for educational uses is the color capabilities of most models.

The graphics and text should also be spaced on the screen to avoid crowding. At lower grade levels, crowding and too much information on the screen can be especially distracting.

Documentation

Documentation is a computer-age term roughly equivalent to the "user's manual" or "instructor's guide" for software. Documentation accompanying the software should include details on implementing the program(s), specifications on the hardware needed, simple "de-bugging" procedures such as what to check if a program will not run or if particular error messages are received, how to contact the software company if special difficulties are encountered, a tutorial to instruct the first-time user in the use and operation of the program and a detailed summary of program contents both from subject matter and computer program points of view. The latter is especially helpful for those desiring to modify or update a program from time to time.

For instructional software, the user's manual should also include details relating to instructional objectives, content, grade level, etc. as noted in other selection guidelines as well as quizzes, worksheets, suggestions for curriculum integration, and other supportive material.

As an additional part of the documentation for programs that can be listed, comments on program working details should be included within each program listing as "REM" statements or their equivalent. The "REM" statements are used to explain to the user what each section of a program does. The computer ignores the "REM" statements when executing (running) a program. Of course, the "REM" statement assumes that the program is written in the BASIC language. Other computer languages and certain extensions of BASIC have other means of entering user comments within programs.

Use-difficulty

Some software packages are obviously more difficult to use than others. Some questions to consider when evaluating use-difficulty include the following.

Is it a turn-key package? That is, does it immediately load and run the proper program upon turning on the power so that a user can utilize the program without delay? Is it menu driven? That is, does the program immediately provide the user with a list of available program options so that any function of the program can be readily accessed? Some programs also provide the user with a "Help" function which can

be entered into at any point in the program. The options available to the user based upon the most recently entered command are then displayed. Pressing another key can get the user back to the exact point in the program left before the "Help" key was pressed. All of these allow for easier use of software.

Another factor to consider in use-difficulty is manipulation of peripheral hardware. Does the complexity of the peripheral equipment such as printers, multiple disk drives, video-cassette decks, modems, etc., and the software manipulation of those peripherals, make the program too difficult to use for those with few computer skills?

Compatibility

One of the biggest past and continuing problems in the computer field is the lack of compatibility among microcomputer systems. The educator has to be sure that commercial software is specifically designed for the microcomputer hardware available in his or her educational institution. Software designed for use on one brand of microcomputer will most likely not run directly on another brand. In many cases, software designed for a particular model of micro-computer may not run on a different model by the same manufacturer. This is true even though the language may be the same, e.g. BASIC, but there are also noncompatible disk and tape operating systems (instructions that make these storage devices work) and non-compatible graphics systems. There may even be different disk operating-systems with the same model of microcomputer.

Peripheral equipment

Does the software need specialized external devices or plug-in boards and modules? Some software is designed to be used with specific plug-in ROM chips (ready-only memory) depending upon the brand of microcomputer used. Other software such as word processing, data-base access, interactive video, and graphics packages may need compatible plug-in boards and such external equipment as printers, video decks, extra disk drives, graphics tablets, modems, etc. in order to make full use of the programs.

Memory size

The software typically will specify the size of memory needed by the microcomputer for which it is intended. Extra memory can be purchased for most microcomputers at reasonable prices up to the intended capacity of the microcomputer and, sometimes, even more.

Previewing software

The best means of evaluating software is to try it before you buy it. Rather than relying on advertisements or glowing descriptions, go to the dealer and try it out or get the software on a 30 day trial basis. A number of commercial producers of instructional computer software will allow for a 30 day preview. That should allow time for tryout with students in the appropriate grade levels. Other producers allow for full refund if the software does not meet requirements. Check preview and return policies before ordering. Also check on guarantee, back-up, and replacement policies in the event that difficulties are encountered with the software. This is especially important for software that is copy-protected. The reputation of the producer for quality and service should obviously be a factor in evaluation.

Software reviews

To keep up with what is available in computer software for educational applications as well as to utilize evaluations of software from other educational users, read the reviews of software as found in a number of journals such as Educational Technology or Booklist. Organizations such as Educational Products Information Exchange (publishers of EPIE Reports) and Dresden Associates, Inc. (publishers of School Microware Review) also publish computer software reviews although the reviews tend to be relatively expensive.

Local Review Sources

One of the most useful by-products of the introduction of the microcomputer into society is the organization of various computer interest groups. The Ohio Educational Library Media Association's Computer Department can be characterized as an educational computing interest group. Local, less formal groups are found in many areas of the country. The local computer store is often the best source on the existence of interest groups active in your area. The store may also be able to provide information about which microcomputers are being used in neighboring school systems and who to contact to find out what educational software is being used. If no local educators' computer interest group exists, such contact may be a good first step in its establishment. In any case, area educators' experiences with various commercial computer software may be of value to you.

Locally-developed programs are often shared through local interest groups as well, and may be a good source of usable low-cost software.

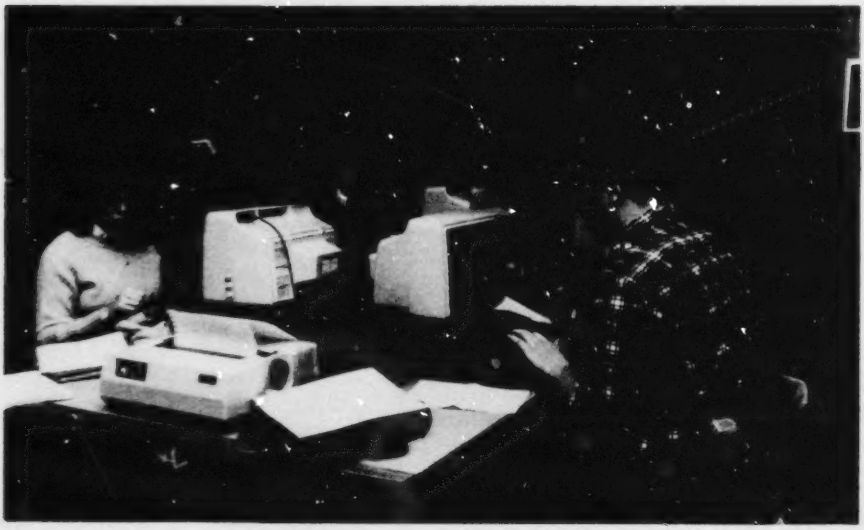
Other Considerations

The evaluation guidelines already listed are necessarily general. Detailed evaluation of specific software may involve comparing several different programs performing the same or similar functions.

Comparisons of speed and flexibility may be appropriate to record keeping and filing programs. Comparisons of special features such as report-formatting and graph generation may be important in spread-sheet calculation programs.

Record keeping for grading purposes may be an important consideration in instructional software.

All of these more specific factors will depend upon local needs and goals. Beginning the evaluation and selection process with a clear understanding of the needs to be met and the questions to be answered will help insure successful selection.



Additional Assistance

A number of publications and articles on computer software evaluation and selection are currently available. Several excellent sources are included in the bibliography.

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CATALOGING AND STORING MICROCOMPUTER MATERIALS

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With the advent of any new materials in the library field, there always needs to be a way to catalog and organize them. Microcomputer software is one of these new areas of material. How do you catalog a microcomputer disk or cassette? OCLC, which many view as an authority on cataloging, has not made any concrete decisions yet as to how this material will be cataloged on their on-line system. They say it will be six months to a year before they go on-line with microcomputer software.

However, do not despair; there are several different ways to approach this material. All the sources checked suggest using AACR 2 and then adapting the system to suit the various needs of the individual media center. The Anglo American Cataloging Rules, 2nd edition, c1978 talks about the cataloging of microcomputer software in Chapter 9. They use the term "Machine Readable Data File" which is defined as "... a body of information coded by methods that require the use of a machine (typically a computer) for processing. Examples are files stored on magnetic tape, punched cards (with or without a magnetic tape strip), apeture cards, punched paper tapes, disk packs, mark sensed cards, and optical character recognition font documents. The term machine-readable data file embraces both the data stored in machine-readable form and the programs used to process data."

MRDF (Machine-Readable Data File) can be used at the top of the catalog card as in this example:

MRDF
324.5
Hai Hail to the chief (machine-readable data file) / by Philip V. Brashear. : Creative Computing, c1980.
1 diskette (DOS 3.3, Apple II Plus, Applesoft BASIC, 48K) + 1 guide.

1. Politics, Practical. 2. Presidents-Elections. I. Brashear, Philip V. II. Title.

Another designation that can be used is MCP which stands for Microcomputer program. Some feel this term is more descriptive for use in a school library media center.

MCP
324.5
Hai Hail to the chief (Microcomputer program) / by Philip V. Brashear. : Creative Computing, c1980.
1 diskette (DOS 3.3, Apple II Plus, Applesoft BASIC, 48K) + 1 guide.

1. Politics, Practical. 2. Presidents-Elections. I. Brashear, Philip V. II. Title.

Still another choice is the term CP which means Computer program.

CP
324.5
Hai Hail to the chief (Computer program) / by Philip V. Brashear. : Creative Computing, c1980.
1 diskette (DOS 3.3, Apple II Plus, Applesoft BASIC, 48K) + 1 guide.

1. Politics, Practical. 2. Presidents-Elections. I. Brashear, Philip V. II. Title.

Once a designator has been selected it is necessary to determine what Dewey call number the material should be assigned. Then the information in the body of the card must be decided. In most cases the title will be used as the main entry with an added entry for the author or person responsible for the program content when determinable.

MRDF
324.5
Hai

Brashear, Philip V.

Hail to the chief (machine-readable data file) / by Philip V. Brashear. Creative Computing, c1980.
1 diskette (DOS 3.3, Apple II Plus, Applesoft BASIC, 48K) + 1 guide.

1. Politics, Practical. 2. Presidents-Elections. I. Brashear, Philip V. II. Title.

Author card

MRDF
324.5
Hai

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Title card (main entry)

Follow AACR 2 format for the collation statement. The number of items, format (diskette or tape), size of disk or tape, operating system (DOS 3.3, CP/M), computer language (Applesoft BASIC, PASCAL, Integer BASIC), capacity of memory (16K, 32K, 16K RAM) and the type of system on which the material is to be used (Apple II, Apple II Plus, TRS 80, PET). Any peripherals, such as disk drives, printer, graphics tablet, etc., which are required to use the material should be included. After this the various subject headings that will be applicable should be listed. See previous example. If there is more than one program on a diskette title or subject analytics should be made.

A summary of this process is as follows:

1. Media Designator Code: MRDF, MCP, or CP
2. Call Number: Dewey Decimal Classification
3. Main Entry: Title
4. Media Designator: Machine-Readable Data File, Microcomputer program, Computer program
5. Collation Statement: Quantity, Program format, type of computer language, Name of computer, model and the amount of memory needed.
6. Subject Headings: Standard subject headings

Once the disk is cataloged, there is still the problem of storage. There are various options in this area also, depending on the facilities and the needs of each library learning center. There are several commercial storage materials available. One is a diskette file tray which will hold only the disks on the check-out counter or elsewhere. Another is the notebook file, which looks like a regular notebook, but has plastic pockets that are punched to fit the notebook and the disk slips into the pocket. The plastic jackets are also available in a hanging file folder pocket which can be used in any hanging file drawer system. If a commercial system is decided on, check to make sure the plastic pockets will have room to hold the teacher's guide that comes with the program, unless these guides will be stored separately. An inexpensive option is to use manila envelopes, usually available in most school offices. The diskettes can be stored in these and the envelopes placed in a box at the circulation desk or any place that is convenient. No matter which storage method selected, pockets and labels should be made for the material, so that it can be checked out and refiled easily.

Sample Labels:

MRDF
324.5
Hai Hail to the chief
1 computer disk. 1 tg.

MCP 324.5 Hai
Hail to the chief
1 computer disk. 1 tg.

Dealing with the new microcomputer software is not difficult if a system is chosen that fits the media center's needs.

Sources

"How to Catalog Computer Programs", Montgomery County, Maryland.

"Processing and Cataloging Computer Software for Schools and Area Education Agencies", State of Iowa, Department of Public Instruction, 1982.

"Suggested Format for Catalog Cards", San Mateo County Office of Education, Redwood City, California.

MICRO-COMPUTER MANAGEMENT

Roger F. Burgess
Media Coordinator
Bedford City Schools

> The computer is the Proteus of machines. Its essence is its universality, its power to simulate. Because it can take on a thousand forms and serve a thousand functions, it can appeal to a thousand tastes.
>
> Seymour Papert, MINDSTORMS

The arrival of the microcomputer in the school library media center has, in many ways, created a new management situation for the media staff. Because microcomputers have many applications, the management of these little but powerful devices can be a complex problem. Many times the micro was purchased with one intent in mind, but in most cases its diversified applications become readily apparent, and the pressure for allocations of the equipment and time turn out to be a very real problem. Most library media specialists soon find out that there are just too few units for too many users, and each user wants more time on the computer than can be made available.

The many applications of the micro create a series of time-sharing problems not only between individual users, but between tasks assigned to the computer. The problem of time-sharing can be particularly crucial if the unit was selected for a dedicated function such as circulation, but has grown to serve many other tasks. In many cases, media personnel found that this problem could be resolved by providing certain periods of the day when the computer could be used for other activities which did not interfere with the dedicated function.

Another common problem encountered is the time allocated to a given user. New computer users soon realize that a great amount of time must be spent in front of the keyboard in order to become proficient in the basic usage of the micro. Facilities faced with only a small number of units — and a large number of users — find that this is a serious problem. In many cases, a reservation system may be necessary in order to avoid conflict and provide equal opportunity for all users. Time frames of one class period; or, in the case of the elementary school, a 20-30 minute period seems to work out best in order to provide the user time at task, while still accommodating a fair number of users. Elementary students tend to like to work together at the keyboard, and therefore a sign-up system might be considered in order to accommodate their desires.

Another facet of dealing with the micro is providing a unit flexible enough to not only serve library or individual-use needs, but also to provide classroom computer time so that the unit may be used as an integrated part of the general classroom period. Many schools have reverted to providing the micro on a roll-around cart so that the unit can easily be moved to the classroom and attached to a large-screen TV monitor for large-group utilization.

One of the dilemmas which has resulted, is the fact that both teachers and students need orientation and computer time as they are often learning about the devices together. Teachers experiencing the micro for the first time and those trying to integrate it into the classroom find a definite need to have access to machines on their personal time, such as after school, on weekends or vacation periods. In many schools this has resulted in requests by teachers to take machines home during these time periods. This often runs contrary to many school policies regarding audio-visual equipment. In other cases, the loan of equipment has been an isolated, once-in-a-while request. Media persons in charge of computers are now finding such requests an everyday occurrence. Herein lies a very difficult problem—how to resolve a teacher's need, as well as insuring that the instruments will be available when needed for school activities. The microcomputer and its associated monitor, disk drive, printer

and other peripherals often represent a sizable investment of hundreds to thousands of dollars. The loss or damage of the unit can literally put a computer management program out of business.

The loan of a microcomputer, its transportation and relocation, enhances the possibility of loss or damage. Of course, the simple solution is to say, "no loan". However, many schools find that this impedes the education process in computer literacy. Therefore, several suggestions have been made to provide for the loan of equipment, while insuring its successful return. A reservation system for the loan of equipment helps to establish a record of demand, and provide equal opportunity for loan. It also provides time for preparation of the equipment for transport. In some schools, computer equipment is loaned only to designated persons directly involved in computer instruction, or is restricted to persons demonstrating competency with the machinery. It is also suggested that the borrower check to be sure that the borrower has liability coverage through a homeowners (or other insurance) policy to protect against the perils of lost or damaged equipment. For the school's protection, each borrower should be asked to sign an agreement indicating that reasonable care will be taken of the equipment in possession, and acceptance for financial liability for any loss or damage for the duration of the loan period. This form may also carry relevant information as to the cost of the unit, and might provide care and handling instructions.

Before equipment is moved, the units should be properly secured in such a way as to minimize equipment damage and to insure maximum security for the unit. There are many cases and storage units for such purposes on the market place today.

As teachers begin to acquire their own systems, they often find a need for additional peripheral units such as printers and disk drives, etc. The result is the inquiry for loans of these types of items. This can be most hazardous to computer systems. Often, the removal of a disk drive or other peripheral requires the dismantling of fragile boards and connectors. This invariably results in a high rate of deterioration of these components. Therefore, the loan of such peripherals is not recommended.

The demands the computer is placing on other audio-visual units such as tape players, patch cables, TV receivers and monitors, all which can become an integral part of a computer system, is causing many media departments to suddenly find themselves short of such items. This brings about scheduling pressures which have not often been experienced prior to the arrival of the micro. The result can be a need to rethink scheduling and priority usage practices based on the educational needs of the equipment in question.

The handling of software for the computer is another area of management which must be addressed, whether it be tape or diskette. The software is, by far, the most fragile element of the computer system's components, and often the most abused. These tiny but valuable units often contain crucial information which, if lost or destroyed, will create havoc with the user's ability to function with the micro. Children especially must be taught how to handle, store and properly care for software for the computer. Careless activities like carrying tapes or diskettes around in notebooks, laying them on top of television receivers or monitors, making them subject to extreme temperature or humidity, often brings grief to the user. All software should be immediately labeled and backed-up wherever possible, and cataloged so that a reference or second copy exists. Often, a printed version of a program can be produced and stored if back-up software is available.

New guidelines set forth on copyright permit the back-up of diskettes for this protection purpose. The computer itself often will act as a simple but effective catalog device for software. Through the use of a simple classification system, titles of programs can be easily stored and retrieved.

It is suggested that school systems provide a centralized depository for all primary copies or master copies of programs. These programs should often be accessible only by designated persons; and when a program is requested, a copy should be

made on the user's own tape or diskette. This helps to insure the stability of a collection, and may reduce school costs for diskettes or tapes in cases where users are required to purchase their own.

The management of the micro and its associated components has created new problems for the library media specialist. However, all seem manageable with a little forethought and planning. As time goes by, more units will be added to the school's inventories, and many of the existing problems will be diminished, while new ones will arise.

The management of software will become a more formidable task, while allocations of computer time will probably diminish as more units appear. It is expected, however, that a higher theft problem will develop, and stronger security will need to be introduced—especially for diskettes, tapes and peripherals which might be stolen.

As the microcomputer becomes more commonplace, it will be accepted as just another educational tool and will fall in place with all other audio-visual media that have gone before. Until then, management of the micro will have to be innovative, creative and tailored to the educational and administrative needs of the school program.

USING A MICROCOMPUTER FOR MEDIA CENTER ADMINISTRATION

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The first computing task that many media specialists ask about for the library is "How can I replace the card catalog?" It is possible to use a microcomputer for that task and for many others in the media center. However, in examining which of the many tasks a computer can do, it is important to decide on priorities for its best use. This is especially important where there are limited funds for equipment or software. Though computerizing the card catalog requires only a moderate additional expense for a hard disk drive and software package, it requires a large clerical expense to enter the old records. Therefore most media centers should begin first to examine other ways to use the computer and leave computerizing the card catalog for the future.

A second major task that is already computerized in many public libraries is circulation. This too can be done with the microcomputer. If a full system is desired one microcomputer will have to be used for this task exclusively and a commercially purchased software package such as Winnebago's or Gaylord's purchased. By using a light pen and bar codes, a media center can quickly be put on line without great clerical expense.

However, for most school media centers neither the computerization of the card catalog nor circulation is a first priority. Instead the media specialist and patrons would be best served if the present clerical and professional activities that are being done inefficiently could be improved with the help of the computer. These tasks include the following, which have been divided for clarity into data handling tasks, word processing tasks, and accounting. These task lists are not meant to be all inclusive but merely to indicate some possibilities. Most media specialists will be able to think of others unique to their own situations.

Data Handling

Overdue lists, union lists, inventories, bibliographies, periodical lists, order list, subject headings, vertical file headings, community resources, address lists, mailing labels, reserves, interest lists

Word Processing

Catalog cards, indexing, abstracting, ready reference file, readability formulas, newsletters

Accounting

Purchase orders, bookkeeping, library statistics, budgeting

To accomplish these tasks and others, computer programs are needed. There are three basic ways to obtain these programs. The first is to write them in-house or hire a programmer to do them. This is usually too expensive and time consuming for most media centers, but may be necessary if some special type of program is needed. A second method is to buy programs specifically written to accomplish a specific library task. There are available programs to do overdues, catalog cards, purchase orders, etc. Usually these are extremely easy to use. The drawbacks of this method are that the programs usually require that the media specialist adapt the present way things are done in the center to a method that the program designates. Also this means purchasing many separate programs which can be expensive. The third method is to purchase general types of programs such as a data base, word processor, and spread sheet and then adapt these programs to the media center's needs. In terms of cost and flexibility this latter method is best but requires time from the media specialist to think through and work through the programs.

To give an example of how these more general programs work the following is provided to show how to use a data base program to design both a bibliography and an overdue system. The data base discussed is Information Master by High

Technology, Oklahoma City, OK; however, the principles of using a general data base would remain the same for any of these types of programs.

To design a bibliography system it is necessary to decide what information should be included. To make an all purpose format that could be used again, the following "fields" or types of information were decided upon: Dewey number, author, title, annotation. The Information Master program is loaded in the "Create System" mode from its menu and those four fields typed in on the screen. Information Master allows up to 20 fields to be used in any one system. The program also allows the user to decide in what alphabetical or other order or "sort" the material will be printed. For a bibliography the sorts by Dewey number and by author were chosen. When the typist is ready to enter the data (book listings) the Information Master program is loaded into the computer and the "Data Entry" mode is chosen from the menu. The following information then appears on the screen:

Dewey number:
Author:
Title:
Annotation:
Annotation:
Annotation:

The typist just enters the information asked for in each entry. If no annotation is needed, those fields are left empty. They can be added at a later date if desired. Each different system can accommodate up to 999 records, certainly more than adequate for bibliographies. Significant time saving results when bibliographies need revision. As new items are obtained they are added without having to retype the entire bibliography. The computer resorts to include them in the proper order. Items no longer available can be deleted just as easily. Thus up-to-date bibliographies on hundreds of subjects become feasible for even a small media center.

An overdue list can be set up using the same data base program. Again the Information Master program is loaded into the computer and the "Create System" mode chosen. The fields decided upon for a high school might include:

Name:
Grade:
Homeroom:
Call number:
Date due:
Title:
Fine due:

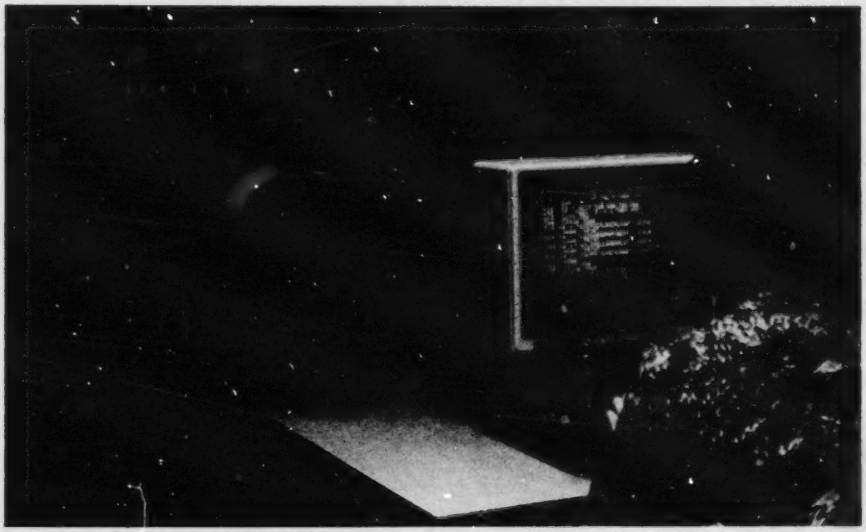
From the information thus, typed in lists can be prepared alphabetically by student name, by grade, or by homeroom teacher. Since reports can be printed in up to fifteen different formats, the media specialist can choose individual notices, lists, or design whatever type is most effective. When materials are returned the record is easily deleted. Time savings result in that there are no longer fine slips to write or second and third notices. Further, at the end of the grading period book cards need not be alphabetized to hold grade cards since the computer already has the records available in this order. Total computer time for entry of names and printing of overdues in a school of 2000 should be only three to four hours a week.

A word processing system is similar in idea to a data base program in that it can also be used to handle a number of different media center tasks. There are word processing packages that are designed so that they can be used in conjunction with a data base package. That way files in one program can be used in the other. One

productive use of this feature in the media center would be to use the word processing package to write a personalized letter to parents of students whose names have been in the overdue file over a specified period of time.

The spread sheet type of program, of which Visicalc is a prominent name, can be adapted to do statistics, budgeting, etc. Or if a simpler program is adequate, a general accounting package could also meet these needs. These general types of programs can be used by teachers, secretaries, and administrators, thus further decreasing their purchase cost.

In sum, the use of the computer in the media center is a natural extension of the function of the center to provide information. A computer is simply an information manipulator. It at long last gives the media specialist the ability to control and disseminate the vast resources of knowledge that are available in any school media center.



27

SETTING UP INSERVICE PROGRAMS ABOUT COMPUTERS

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The presence of computer technology has created a need for computer awareness and computer literacy. Potential audiences or consumers in education are: students, parents, teachers, and administrators. Each audience looks at computers from different standpoints. Inservice training experiences, therefore, ought to be geared toward meeting their individual needs. The following pages outline some guidelines to planning inservice education about computers. Many of the suggestions are common sense and are based on actual inservice experiences. They are included because common sense often goes awry when computers are discussed and implemented.

The computer is an innovation that has thrust itself into the realm of education, rather than being developed within education. The emphasis on computers in society and the conversion to information processing has brought the computer to the younger generation. Their response is enthusiastic and receptive of the changes imposed by advancing technology. This impacts on adults who are unfamiliar with the new technology and makes the need for training even more necessary.

Anyone can deliver inservice about computers. The topic is focused on at almost every professional meeting. Attendance at those sessions is usually greater than for other topics. Currently, the prerequisites for being a speaker are: 1) to have some experience working with computers; 2) to sell computer technology; 3) to use computers; and/or 4) to have read about and/or be receptive about computers. However, expertise is in the mind of the beholder. Because there is such a need to know by so many, a little knowledge makes anyone appear knowledgeable. It is, therefore, important to choose what needs to be a part of an inservice program and who can best deliver that message.

An inservice program should take place only after extensive planning has occurred. Such planning takes place based on a needs assessment which addresses the perceived needs of the library, department, school, or district. These perceived needs fall into four areas: administrative uses of the computer, programming, computer-assisted instruction, and computer literacy or awareness. Administrative uses of the computer may be in finance, scheduling of classes, attendance, grades, and the management of instruction. Programming focuses on the ability to learn how to make the computer perform a task using a language which the computer understands. Computer-assisted instruction involves the use of the computer by a student to practice a skill which has been covered in the curriculum. Computer literacy or awareness is learning about computers and their uses both within the school and the environment outside the school. It involves the operation of the computer and performing tasks with the equipment found in the technology of today as well as understanding that the future is ever-expanding in this field.

Perceived needs ought to be grouped in both the short and long range. Whoever is in charge of the computer and its use ought to focus on what expectations are in the near future and project what is expected in the next five years. It is often very difficult to know where to begin because the state of computer technology projects the image of change itself. How can anyone predict how the computer ought to be used since it is so versatile? The answer is simple. Pick one area and begin. You may choose computer assisted instruction because you and a small group of teachers will use the computer equipment daily. In a media center, the management of overdue books may be a priority. Start somewhere. Set a short run goal that is both manageable and where success will take place. Then project other ideas and set

them into a short- and long-range framework that is both cost efficient and time efficient in terms of personnel. If you are in charge, be sure that you can fit into the program because you need to allow yourself time to become motivated by the computer's capacity to do tasks.

The task of developing short- and long-range goals is based on an effective program of inservice training which induces educators into implementing computer utilization. Inservice is a three phase approach: introduction, involvement, and implementation. At the outset, members of a staff will be at all three levels. Through inservice, staff will move through each of the three phases to address one or more of the areas of perceived needs listed above. The key is the effective use of the individuals who are already at the later phases to help those who are just learning.

PHASE I: INTRODUCTION

Inservice with computers ought to be short, sweet, and to the point the first time around. The following chart gives examples of introductory inservice programs for the different audiences: administrators, parents, teachers, and students. In each case, the primary objective is to become familiar with the equipment and to discuss its use in the school setting.

FIGURE ONE: INTRODUCTORY INSERVICE PROGRAMS

AUDIENCE	SCHEDULE TIME	TIME LIMIT	DESCRIPTION OF INSERVICE
Administrators	During school day	One hour	1. Overview of computer use as lecture presentation. 2. Examination of management and computer-assisted instruction applications. Allow for hands-on if someone wishes. 3. Discussion of computer use in school settings. 4. Work with group of 5-15.
Teachers	Department or grade level meeting	45 minutes	1. Overview of the mechanics of using the computer on one page. 2. Use of sample programs in computer-assisted instruction in the teacher's subject area and/or grade level. 3. Evaluation of the quality and future use of the program by the teacher. 4. Teachers work in groups no larger than three.
Parents	Evening meeting	5-15 minutes	1. Include as a drop-in experience along with other activities at a parent meeting (i.e. meet-the-teacher night). Include building administrator. 2. Use programs which demonstrate good computer-assisted instruction involving two users at the same time. 3. Have parents use the programs. 4. Discuss computer use in the school in general terms soliciting input from parents.
Students	During school day	One class period	1. Packet that includes different kinds of computer programs written in a step-by-step approach. 2. Use of the computer with computer-assisted instruction and games applications. 3. Student writes answers to questions in packet that can only be found by using the computer program. 4. One-two students use the computer at a time and are asked their impressions about the experience.

The above inservice experiences provide each group with an overview based on their own background and expertise. Administrators may be more receptive if an

outside expert works with you to deliver the content. The teachers will respond more naturally if they are given the opportunity to evaluate the content of programs since this is an activity that is done all the time. Parents need to have an impression provided by a quick hands-on approach. Students will respond individually if the initial experience is set up so that they can get involved at their own pace.

The inservice program must have the participation of administrators. This group typically makes decisions about how funds are to be spent and how computers are to be used. If the administrator is unfamiliar with the use of the equipment, the possibilities for widespread application becomes limited. It becomes important to have individual or small group inservice to provide the opportunity to experience the computer first-hand. This group will be the most afraid of touching the computer at first. However, first-hand experience and encouragement may provide the opportunity for prolonged growth in the long run.

The end of the first phase comes with sporadic computer use by some of the participants in the introductory inservice. Similar types of introductory programs may have to be done again to reach the level of specificity by the participants. However, for the moment, interest has been generated. It's time to move on with those interested in becoming more involved.

PHASE II: INVOLVEMENT

A cadre of educators will emerge as having greater interest. Some of them will have programming expertise. Others will be software hunters. All will want hands-on use of computers. It is this group who will carry the utilization of the computer for some time.

Someone needs to direct the effort. Expertise with computers is not as necessary as the following skills: organization, timing, ability to write goals and objectives, flexibility, vision, and communication skills. A network of individuals across levels (secondary, elementary), roles (teachers, administrators), and institutions (school, university, business) needs to be formed to help with the adaptation of computer use into the school setting. The network is loosely formed with healthy respect among all members as being equals in contributing their expertise toward eventual implementation.

A task that emerges is the establishment of short- and long-range goals. The key word here is flexibility. The nature of computer technology makes its use subject to an increasing array of greater possibilities. An analogy might be the beginning of a hailstorm on a large pond. The first hailstorm causes a small ripple effect which dissipates immediately. The next two or three cause other small ripples. Gradually, however, more and more hailstones cause multiple ripples which intersect and produce a new overall effect. Goal setting should be done in the same way. When the first hailstorm is over, a new richer pool of knowledge will result from individual efforts which have been blended together.

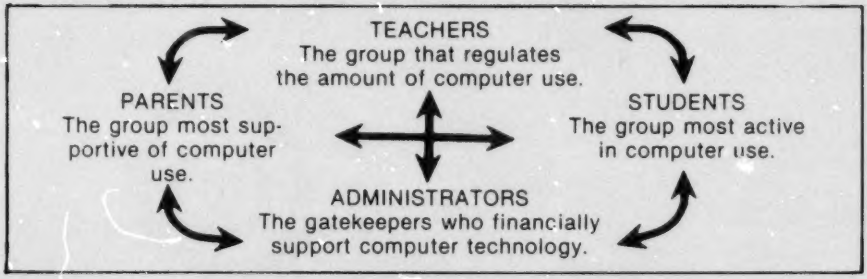
The short- and long-range needs ought to be written in the form of objectives so that everyone understands what is possible given the current capabilities of staff and time constraints. Too often, expectations are set for the use of computers which cannot be met because of time constraints which pose frustrations on everyone's part. The saying is "DO WHAT YOU CAN DO." Post those objectives so that everyone knows what can and will be done. Perhaps you can elicit some helpers who will add to the knowledge base to allow computers to become implemented more rapidly.

A side note to establishing long- and short-range goals is in order. From personal observation and experience, most schools have opted to spend a great deal of effort in computer-assisted instruction as the first area of emphasis. This area would appear to be the most appealing because so many computer programs are available. However, if quality is important, beware. The quantity of activities available for pur-

chase far exceeds the quality of the activities themselves. Many programs perform activities which can be done just as well with pencil and paper. Perhaps attention to the computer's function as a time-saver in terms of performing routine tasks that will save teacher time will enhance the long-range adaptation of the computer into everyday use.

The four groups which impact upon computer implementation need to be woven into the communication network. The role of each is critical.

FIGURE TWO: COMMUNICATION NETWORK OF PUBLICS


TEACHERS
The group that regulates the amount of computer use.
PARENTS
The group most supportive of computer use.
STUDENTS
The group most active in computer use.
ADMINISTRATORS
The gatekeepers who financially support computer technology.

Each of the groups has an impact on the advancement of computer technology:

TEACHERS	— Use and evaluate software programs. — Develop computer software programs.
ADMINISTRATORS	— Make decisions about staff and schedule. — Allocate funds for computer supplies and equipment.
STUDENTS	— Become more motivated with computer use. — Gain in achievement scores with computer use.
PARENTS	— Support efforts and pressure the school for more technology. — Provide voluntary and financial support.

The development of short- and long-range goals comes from realizing the contribution of each of the above groups to the final outcome(s) desired. Seminars and minicourses for the above groups are important to expand upon the four areas of utilization: administrative uses, programming, computer-assisted instruction, and computer literacy or awareness. Individuals will emerge from the groups who will offer expertise and a plan for future utilization. Implementation can now begin to take place on a small scale.

PHASE III: IMPLEMENTATION

Implementation is the operationalizing of some facet of computer use. It is the first hailstorm that causes a new richer resource network in the pool of computer use. The following sequence of steps may be helpful in implementing a facet of computer use (ie. attendance, computer-assisted instruction in mathematics, library overdues).

FIGURE THREE: STEPS IN IMPLEMENTING COMPUTER USE

1. State the objective and its outcome.
2. State those to be effected.
3. Have those effected give input on the anticipated outcome.
4. Review and purchase OR develop appropriate software computer programs.
5. Develop documentation and training program.
6. Give training to all those who will participate.
7. Develop schedule for implementation.
8. Use the software computer programs.
9. Allow for immediate feedback.
10. Make improvements to program based on feedback.

The above steps serve as checkpoints to allow people to become a part of computer use. As one objective is being implemented, others will crop up and demand attention. The network should respond to the new need and proceed through the steps from the beginning.

Inservice training in the implementation phase may have a more specific focus but is just as necessary. The following tips should be used to plan effective inservice:

FIGURE FOUR: TIPS FOR EFFECTIVE INSERVICE

1. Have a plan in mind — each session fits into a larger scheme.
2. State a goal and specific objectives for each session.
3. Address the audience from its entry level.
4. Have appropriate handouts.
5. Go slow . . . Interest does not occur only because of your enthusiasm.
6. State how the inservice will benefit the participants.
7. Invite reactions, interactions.

In the final analysis, the use of computers in educational settings will be controlled by teachers. Administrators can provide financial support and creative leadership to enable computer use to expand. Parent and student demand for computer utilization will continue to be a pressure on schools for some time.

Inservice training is the key that provides for computer utilization to occur. Each individual who takes part in such training is both an expert and a resource. Everyone can learn about computer use. Change will be incremental rather than rapid. Finally, change occurs most rapidly when each participant sees payoff for her/himself. This is perhaps the greatest challenge for the value of effective inservice and the future use of computers in educational settings.

MICROCOMPUTER LANGUAGES

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Bowling Green, Ohio

As it sits on the table a microcomputer is a rather inert machine though certainly one with a lot of potential. But to perform even the simplest task, such as to display the word "Hello" on the screen, someone must give it instructions. The set of instructions that guides the actions of a computer constitutes a "program." And the program must be written using very precise syntax and punctuation that your micro can understand, hence the term "programming languages."

Over 200 programming languages have been developed for computers in general. Most languages were originally conceived for large computers of the type used by banks but many have been adapted for use on microcomputers. Here is a brief description of the microcomputer programming languages that seem to have the most usefulness or promise for microcomputers in schools. The list is not intended to be exhaustive. New languages appear frequently enough to prevent any hope for a definitive listing.

On most microcomputers used in schools the "built-in" programming language is BASIC, an acronym for Beginners All-purpose Symbolic Instruction Code. Developed at Dartmouth College as an easy-to-learn introductory language, BASIC is so universal on microcomputers that some familiarity with it would seem essential. Most people find BASIC easy to learn, adequate for writing many types of programs, and particularly good for programs where data manipulation is required. However, BASIC is usually not considered the best language for creating graphics or for intermixing graphics and text such as putting labels on drawings.

Actually you can learn other languages without taking the time to learn BASIC. However the idea of developing a series of logical, sequential instructions is necessary for programming in any language.

Many instructional programs are created by teachers in PILOT (for Programmed Inquiry, Learning, Or Teaching). Most people find PILOT not too difficult to learn. PILOT is particularly good for graphics, sounds, intermixing text and drawings, and for creating character sets more appropriate in some instances than the letters and numbers that are standard on a computer. PILOT provides flexibility for question and answer possibilities, and for branching that makes individualization easy to handle. Most versions of PILOT require a specific version of BASIC in ROM and some require additional accessories. For example, Apple PILOT requires two disk drives and Applesoft BASIC when used in the authoring mode, while a one disk version of PILOT from Muse requires Integer BASIC in ROM.

Two languages for specific applications have been around even longer than BASIC and can be added to most microcomputers. FORTRAN (from FORmula TRANslation) was developed specifically for use in the sciences and engineering for handling large amounts of numerical data in complex formulas. COBOL (from COmmon Business Oriented Language) was developed specifically for business data processing. Any students involved with computers for business purposes would certainly need an exposure to COBOL.

Another programming language adapted for microcomputers is Pascal, developed in Switzerland and named for the French mathematician. Pascal is sometimes described as a cross between BASIC and FORTRAN. Pascal does a good job with complex formulas. Pascal uses "structured" programming, where the overall program is broken into essential components which are developed separately and then easily referenced back and forth as needed. Some who teach computer science find that this structuring makes Pascal students better programmers even when working in another language. In the opinion of some, Pascal will eventually replace BASIC

as the common language for microcomputers. The advance placement test in computer science, due in 1983, will require a knowledge of Pascal. Full versions of Pascal use a lot of memory and the "tiny" versions are somewhat limited.

LOGO is a programming language developed at the Massachusetts Institute of Technology specifically for teaching programming. As adapted for microcomputers and using "turtle graphics" LOGO is often described as the ideal language for introducing even primary students to the art of programming though not everyone agrees with this. LOGO is somewhat structured. Components of a program can be written independently and then inserted at appropriate points. LOGO can be used for creating instructional programs but offers little that cannot be accomplished with PILOT. Some versions of LOGO have memory requirements beyond those usually considered as standard. Incidentally, some versions of Pascal offer turtle graphics though most other features of LOGO are not included.

While BASIC is probably the built-in language for a micro it is usually not too difficult to add one or more of the others. This addition is usually accomplished by either inserting a component into the computer, using a special language disk or cassette, using a language cartridge, or some combination of these actions. Do be aware that all languages are not currently available for all micros.

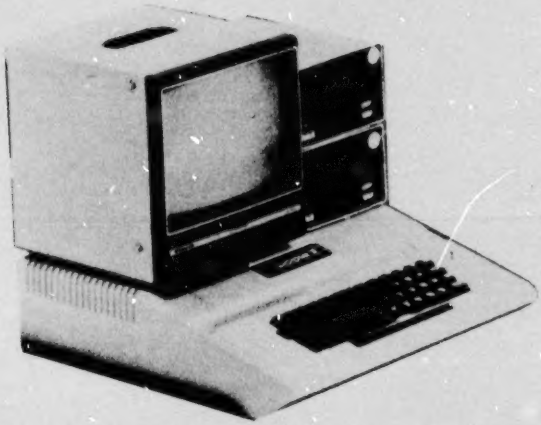
One of the frustrations of microcomputer languages is that there are many different, incompatible versions of the same language. For BASIC alone there are estimates of over 75 versions or "dialects." This means that a BASIC program written for a Commodore Pet will probably not enter properly into an Atari 800 or any other common brand. There is even incompatibility within brands. An Apple II Plus uses Applesoft BASIC while the Apple II (no Plus) uses Integer BASIC and programs for one do not run on the other without modification. In a similar fashion, Radio Shack's Color Computer uses a version of BASIC that is not acceptable to the TRS 80 I or III and vice versa. While other microcomputer languages do not as yet have the large number of dialects found in BASIC, they do have their variations and one must be certain that the version selected is the one appropriate.

Why so many languages? Probably because no one has yet developed one language that serves all purposes well. FORTRAN is great for complex mathematical calculations but COBOL was developed because FORTRAN was limited in handling large files such as credit card accounts. In the same way there is no "best" language for microcomputers. It depends on what needs to be done. If lessons for instruction which need graphics are necessary PILOT or perhaps LOGO would be a good choice. For introducing students to the writing of programs a common suggestion today is to use LOGO in the early grades, switch to BASIC in upper elementary and junior high, and introduce Pascal in the high school. Others say that BASIC is adequate at all levels. Certainly if the school is committed to computer science and has students who want to qualify for advance placement testing, Pascal will be essential.

Of course teachers and students can do much with microcomputers without any knowledge of programming. The number of instructional programs is growing by leaps and bounds. But the challenge of creating one's own set of instructions to cause that inert machine to perform as is desired usually grows with familiarity.

Actually programs can be created without knowing any computer language. Commonly referred to as "authoring systems" (as opposed to the programming or authoring languages described above) these "menu driven" systems provide an almost "fill-in-the-blank" series of questions or commands to which only a response is needed to create a lesson and/or quiz. And students only see the instructional program, not all the questions answered to create it. Authoring systems are not as flexible as programming languages for developing lessons but they do provide a quick way to get started. For a description and comparison of most currently available authoring systems see the May/June, 1982, issue of **Electronic Learning.** The article also includes information on seven versions of PILOT.

The world of microcomputers is changing rapidly today and the world of programming languages is changing with it. FORTH and LISP are languages that may be useful in specific areas. Current literature contains many claims for newer authoring systems that will set up a card catalog, create music lessons, or supply graphics without the user having to learn any language. Yet for those who get involved, the writing of programs is intriguing, frustrating, fun and at times overwhelming. The only limit is the amount of time and effort one is willing to spend.



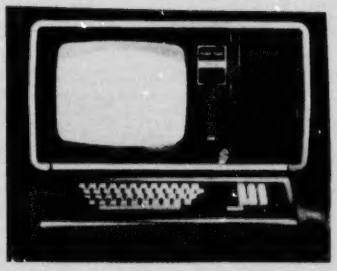
LOGO

FORTRAN

BASIC

Pilot

COBOL



Pascal

36

TROUBLE SHOOTING MICROCOMPUTERS

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Although microcomputers are fairly reliable, breakdowns can occur and there may be some pointers herein that will save some money. Local repair houses in most areas get an average of $35 per hour just to look at a computer. Most of the micros referred to here are Apple II plus 48K disk drive units and Radio Shack III 48K double drives computers.

The first thing you should consider is the purchase of a diagnostic program that can be run on the ailing computer to help find the problem. Typically, these programs will include test routines that can test RAM, ROM, and disk operation. All TRS 80 disk based machines come with a test routine as part of DOS, but it is limited to testing ROM and RAM. (Apple IIe also has some built-in diagnostics.) Some of the more complete programs also test accessories plugged into the computer such as paddles, joy sticks, printers and extra memory cards. The better programs will find the problem, explain what component (IC) is bad and even print out a condition report. Check with the dealer to determine the best diagnostic program for a school situation. They range in price from about $40 to $150. When the program is run it will then be possible to determine if the computer should be repaired locally or sent out. Please be aware that with Radio Shack and some other companies the warranty can be voided if the machine is opened. However, with diagnostics one still has the advantage of knowing the cause of the problem and this can cut down the time the repair shop will have to spend looking for it.

One of the biggest problems of the Apple computer is with the disk drive. Often they will run an Apple disk program, but not one from a locally made disk. Several things can cause this problem. Usually the speed is out of adjustment. It can be brought back to the correct speed using a speed control program from the diagnostic program and a small screwdriver. First remove the disk drive cover (four screws on the bottom) and insert the speed test program in the drive. Run the program and notice the indicator that tells the correct speed (300 rpm). The small screwdriver is used to adjust the speed control potentiometer located on the right side of the drive toward the lower back corner about ¾ of an inch up and ¾ of an inch from the back of the drive. This may vary from drive to drive, but it is usually near this position. There is a small brass screw in the control that can be turned to get the correct speed. It is better to be slightly UNDER 300 rpm than over it. It should be within 5 rpm of 300.

Another problem with the Apples and some of the older Model I Radio Shacks is keyboard bounce, that is, keys not making good contact when pressed. The solution is to pull the plastic key cover up from the keyboard and clean the contacts with a contact cleaner like LPS, that does not leave a deposit. Also wires may have to be bent slightly to get better contact.

The other problem that comes up with both the Apple and the Radio Shack disk drives is dirty heads on the drive. This can be corrected using a head cleaner kit. This consists of two cleaning diskettes, a cleaning fluid and instructions for use. One kit can be purchased for loan to school buildings and another used as part of a tool kit that is carried to the buildings during routine maintenance. It might also be a good idea to write a program to keep track of the number and type of service calls performed on a machine. This service record can be carried with the maintenance person and updated each time work is done on a machine.

A further problem with the Apple II + is a tendency for the power switch to wear out. Apple authorized repair for this item is very costly, so the district might consider having a knowledgeable electronics teacher or serviceman open the power supply and replace the switch. A better way is to avoid the problem by teaching users to exit programs using reset and rebooting via PR#6, rather than turning off and on the computer.

Two of the worst enemies of computers are dust and static electricity. The easiest way to control dust is to invest in soft plastic dust covers for the machines, and insist that they be covered after use. Try to make sure the machines are not being used near chalkboards or other sources of dust. The dust can clog disk drive heads, interfere with electrical contacts and reduce cooling efficiency, all of which can lead to bigger problems. Static electricity can also be a problem with micros and can cause temporary or permanent damage to the memory of the computer or worse. The problem most often comes from plastic chairs and/or carpeting. This static build-up can be eliminated by wiping the chairs with the same static eliminators that are used in electric clothes dryers, or by buying an anti-static spray from the computer dealer and simply spraying the chairs and the carpet. If that still does not solve the problem a company can come in to do a professional treatment of the room, however, it might be easier to just move the computer. Static mats to absorb the voltage can also be tried.

Most of the suggestions made here could be done by a person with little or no training and should save some money. However, it must be emphasized that if the staff is not experienced with electronics it might be better not to tinker around inside the micro as damage could be done that would cost more repair than the savings from inhouse work warrants.

NETWORKING:

VITAL LINKS TO A TOTAL INFORMATION SYSTEM

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Introduction

Interest in the application of small computers in education has never been more intense. This interest has occurred at the same time that funding levels in education have decreased depressingly. But successful uses of microcomputers in various settings have aroused both curiosity and genuine interest. And now the general public expects that computers will be used to assist the delivery of instruction and to manage learning resources on a regular basis. Consequently, it has become clear that knowledge of the capabilities and limitations of computer technology and facility in computer operations is as important to School Media Specialists (and to those who educate these Specialists) as they are to the teachers, administrators, and others who envision the "computerized" classroom. Indeed, it might be argued that institution-based education might soon cease to exist — in favor of computer-based information centers which, by virtue of communication links within and outside the building, would deliver consistent, precise, and individualized instruction, information, and advice while helping learners retain a "touch with reality" unachievable by today's standards. So perhaps facility with computer applications in education is actually more important to Educational Media Professionals than to most others because it is these professionals who would most likely be responsible for managing the information systems indicated above. (And lest the notion of computer-based information/learning centers seem far-fetched, note that for certain students in selected programs around the country, these systems already exist and are operating nicely, thank you!)

This paper presents the concept of "networking" as a crucial function of School Media Specialists — with profound importance (and application) for those who provide educational experiences and requirements for these Specialists. The paper begins by presenting terms and definitions, continues with an exploration of certain hardware, software, and personnel competency criteria attendant to the concept of "networking," and concludes with a set of resources to assist both the practitioner and the educator.

Terms and Definitions

On a generic level, "networking" implies a continuing collaboration and sharing of resources. A related concept is that "networking" effectively reduces costs by increasing productivity without extensive duplication (of services, of facilities, of materials, of equipment, etc.). Computer-based networks have realized sizable "savings" by:

- centralizing certain information processing activities,
- sharing complementary expertise,
- parceling out tasks in otherwise overwhelming projects, and
- functioning as large budgetary units when purchasing hardware and software.

Central to most computer networks are communications links whereby one computer user is connected to another computer or to another computer user.

"Teleprocessing" is a term denoting communication between computers and indicates the merging of two technologies: modern electronic communications (e.g., via telephone lines, radio waves, fiber optic cables, etc.) and modern electronic data processing (i.e., with computers). The advantages of teleprocessing are straightforward:

data processing is not restricted geographically;
data and software can be shared;
the processing capabilities of different computers can be shared; and
computing activities (and sometimes computing resources) can be decentralized.

A limitation of teleprocessing is that procedures and, to varying degrees, equipment must be standardized in order to function in a network.

Teleprocessing networks operate in a number of configurations, but two general types are "star networks" and "distributed networks."

"Star networks" are common configurations when large, main-frame computers are used. Terminals (sometimes "intelligent terminals" with a limited internal memory) are connected to a single central computer, which acts as a central processor and as a device for managing communications between terminals.

"Distributed networks" are more common when smaller, mini- and microcomputers are interconnected. Essentially, computer users at various locations communicate with other users' computers (which may maintain specialized files and which may process information among themselves).

Five pieces of equipment are needed to operate a bare-bones distributed network: two microcomputers, a communications (e.g., telephone) line, and two interconnection devices. The interconnection devices connect the computers to the communication line and convert the binary digital pulses of the computer to analog signals compatible with the transmission lines. Because they perform this modulation function, they are generally called "MODEMs", a contraction of "MOdulator/DEModulator.

Modems come in two forms, "acoustic couplers" (which connect the computer to a conventional telephone handset) and "direct connect units" which connect the computer to a telephone wall receptacle. Direct connect units are more reliable than acoustic couplers, and many models are capable of automatic phone answering (as well as dialing).

Hardware and Software Criteria

One of the biggest problems in computing (educational and otherwise) is equipment incompatibility. Equipment incompatibility has, in turn, led to program incompatibility, and program incompatibility has, in turn, stifled communication — ironically, in an area where one might have assumed that communications would be enhanced!

For people interested in developing network communications, the most important equipment-related criterion is a determination of the kinds of "output" desired - i.e., the kinds of data to be presented, the formats in which the data would be presented, whether output would be in printed form or stored on disk, etc. Furthermore, this "output criterion" should be determined by all parties involved.

Having determined the kinds of output to be generated by the network, the next equipment-related criterion pertains to the processing functions required to generate

the desired output. The nature of the processing activities will have a determining effect on the types of hardware (and software) available to perform the tasks efficiently.

The last equipment-related criterion pertains to ease of use. This criterion is especially important if more than one person is likely to use a given piece of equipment and/or if the equipment will be used on an occasional basis.

Software selection or development, as indicated above, is at least as important as hardware selection. Indeed, software considerations should probably precede hardware considerations. This is beause the expertise and time required to design, "debug" (correct), document, and disseminate a program probably exceeds the capabilities of most education professionals. The encouraging fact is, however, that more and more commercial program development firms are marketing software packages that are suitable (at least as a reasonable approximation) to the needs of teachers, administrators, library/media specialists, and other education professionals. (But, at $2000 for a microcomputer-based cataloging program, the sharing of software may represent the only choice for library/media specialists in a given school district!)

Finally, it must be recognized that programs, once selected (or developed), can be transferred only to compatible equipment. It may not be difficult to operate a program with different pieces of equipment (as long as the operating codes are known and used consistently), but the transfer of programs and data may be impeded (or, at worst, blocked) by incompatible equipment.

Personnel Competency Criteria

The knowledge and skills needed by people to function as part of a network are not well defined. This has led to difficulties when novices make errors that "old hands" may regard as inefficient (at best) or unnecessarily disastrous (at worst). But some criteria are clear.

The first criterion for the user of a computer network is that the person be able to operate the terminal or microcomputer being used. The use of "control" key combinations, cursor movements, and other computer keyboard features which go beyond those of a typewriter keyboard should be understood, and the user should be facile with them.

The second criterion for the network user is familiarity with certain standard terminology - e.g., the meaning of "I/O error", "BAUD rate", and other common terms which a network user may encounter. Knowledge of these terms will help the user to analyse problems if and when they occur and will help the user to take appropriate actions so others are not adversely affected.

The third criterion is an obvious one. The user should be familiar with the capabilities and operational procedures of the network. This criterion asks a lot of the network user, but many times the user can begin modestly by using an uncomplicated part of the network - e.g., selecting programs from a menu - and then progressively adding knowledge and skill in other areas.

A fourth criterion is that users of networks - especially of small networks - should get to know other users of the network and should be able to identify their particular areas of expertise. Some network users may be excellent programmers and program debuggers, others may be excellent documentation specialists, etc.

Finally, network users should become network contributors - often as programmers, but also in other capacities, e.g., as proposal writers, as program documentors, as field testers of programs, etc. To function effectively at this level, network users must have mastered the other criteria and must be willing to play a major role in the operation of the network. And note: when a number of network users are functioning at this level, the true value of a network is finally achieved.

The implications of these personnel competency criteria are apparent - for

Library/Media Specialists and those who educate library/media professionals alike. On the one hand, it seems likely that practitioners must develop these competencies because their professional activities will become increasingly "computerized", and networks may become a dominant aspect of that "computerization." On the other hand, computer technology (the hardware, the software, and the procedures for their effective use) is - and probably will remain - complex and not inherently obvious in its functioning. For this reason, prospective users of computer technology require (and deserve) thoughtful attention and measured assistance. (Unfortunately, the people who sell and service computer equipment often do not seem to understand that educators do not usually have backgrounds in electrical engineering and/or computer science!) It is therefore imperative that familiarity with computer networks be a regular component of the curriculum for Library/Media Specialists.

Summary

It has been predicted that "networking will be to computer education what the shuttle Columbia was to the space program: an advance that opens yet more possibilities in an already exciting new field." For education professionals whose business is instructional and information resources, that prediction holds great promise. But the promise will only come to fruition when library/media specialists and their college faculty incorporate "networking" into the professional curriculum and when "networking" becomes accepted as a standard means by which intra-district, inter-district, and regional collaboration occurs.

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RESOURCES ON COMPUTER NETWORKS AND NETWORKING

Network Services:

EDUNET
P.O. Box 364
Princeton, New Jersey 08540

This network is operated by EDUCOM, a higher education organization, that promotes inter-university cooperation at 15 sites hosting 25 computers. Its use is confined to institutional members at university, college, and non-profit organizations.

MicroNET
Compuserve
Personal Computing Division
5000 Arlington Centre Boulevard
Columbus, Ohio 43220
(800) 848-8990; (614) 457-8600

A computer timesharing and software distribution service organization for home and small business applications. The large library includes programs, educational aids, games and simulations, business application programs, programming languages, and programming and diagnostic tools. Most are available at no charge other than the connect time rate.

MicroSIFT
Northwest Regional Educational Laboratory
710 Second Avenue NW
Portland, Oregon 97204

The Computer Resource Center is spearheading a project to design and implement evaluation tools and procedures for systematically evaluating computer courseware intended for use in schools. It is hoped that regional centers around the country will participate in this project.

The Source
Telecomputing Corporation of America
1616 Anderson Road
McLean, Virginia 22102
(800) 336-3330

A computer timesharing and software distribution service. Furthermore, the Source features other services, such as a "money-saver buying service", a "travel club", a "national real estate locater service", etc. The education section reportedly contains tutorials and drill and practice programs across the full spectrum of subject matter areas.

Network Equipment (for Microcomputers) — A Sampler

Corvus Systems' Constellation Controller

D. C. Hayes Micromodem and Smart Modem interconnecting devices

Radio Shack's Network Controller and Telephone Interface II (acoustic coupler)

INTERACTIVE VIDEO

Richard Post
Ohio University Computing
and Learning Services

Linear Video

For years, the world of instructional television, or video, has been limited by being a linear media format. That is, a television program was started at the beginning and viewed from start to finish. Of course, if the presentation was on videotape, it could be manually stopped, started, replayed or portions of the tape could be skipped, but the programs were essentially designed to be viewed in their entirety.

Computer-assisted Instruction

Computer-assisted instruction, on the other hand, allowed an instructional designer to use all of the power of the computer to branch students to remedial sections of a course, to ask questions which required proper responses in order for students to continue with more difficult material, to diagnose weak areas in the course materials through post-test analysis, to use the computer to act as an infinitely patient tutor for drill and practice routines, or to provide a simplified simulation of an economic or social process. Early computer-assisted instruction, however, was largely limited to presenting textual information and simple line drawings on the monitor screens. Although some colorful graphics capabilities were available on certain computers, especially later on in microcomputers, the more complex graphics tended to utilize large amounts of on-board memory and/or magnetic storage. Even today, computer graphics are limited. Reproducing a visual equal to the quality of even a single frame of a normal video scene would require thousands of pixels at multiple colors and multiple intensity levels. Such a visual would require much more memory than that available in a typical microcomputer.

Interactive Video

One big advantage of the computer however, is its ability to control other electronic and mechanical devices in robotic fashion. With the advent of both the low priced microcomputer and the random-access video-cassette recorder and videodisc player, it was inevitable that their interconnecting devices would come on the market shortly afterwards. The result, now generally called interactive video, combines the advantages of both video and computer assisted instruction.

Types of Interactive Video

Interactive video systems come in about four major configurations depending upon whether or not an external computer is used and whether a video-cassette or videodisc player is used. (See figure 1.)

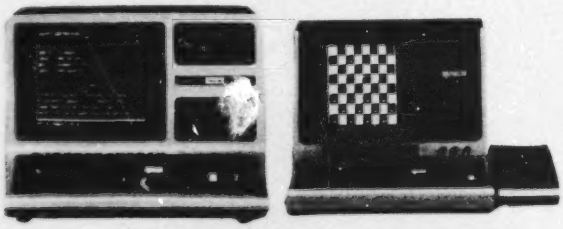

FIGURE 1. INTERACTIVE VIDEO SYSTEMS

	Control Source: internal microprocessor or control device	Control Source: external computer
Video-cassette	Simple programmable remote control (e.g. Sony's Video Responder System).	Requires random access video-cassette deck. Requires proper interface and programming on external computer.
Videodisc (laser-optical CAV)	Disc encoded with interactive programming as well as video.	Video on disc. Interactive programming on external computer. Requires proper interface.

Videodisc Use

Of the four types of systems, the most expensive and most versatile is the laser-optical videodisc with external computer. The videodisc has the capability of accessing each of 54,000 frames of video information with pinpoint accuracy and to allow the viewer to look at a single frame for as long as necessary. It can also be used at slow motion or at the normal video viewing speed of 30 frames per second. Audio from either of two channels can be heard only at the 30 frames per second speed. At the full viewing speed, there are 30 minutes of playing time available per disc side (assuming an interactive-capable CAV disc). An external computer with the proper interface can access any of the 54,000 frames in single frame fashion or any segment of video at normal playback speed. An interactive branched program can therefore be designed which is as complex as the needs of the students require within the 54,000 frame limitation.

The videodisc can itself also be programmed. In this mode, it uses the videodisc player's own microprocessor. The memory of the on-board microprocessor is more limited than that of an external computer however, and all printed or textual information needed for the lesson must be on the videodisc itself. All of the lesson programming must also be precisely completed prior to disc mastering because all of the programming information is stored on the disc in addition to video. Once the disc is pressed no further changes can be readily made.

Available discs such as the THE PUZZLE OF THE TACOMA NARROWS BRIDGE, published by John Wiley and Sons Publishers, readily demonstrate the capabilities of a programmed videodisc. A student may study the effects of wind and resonance in one of three levels; without math, with limited math ability, and with full math and theory. All of this is incorporated on a single disc without the use of an external computer.

One of the major limitations of the videodisc is that it is a playback-only medium. All disc recording and mastering can only be accomplished by a very few video production divisions such as that of the 3-M Company. Cost estimates for mastering range from $1500 per videodisc side and up. Subsequent videodiscs in quantity are, of course, much less expensive. The mastering cost does not include original video production which must be done using broadcast-quality frame-accessible video recording equipment.

Video-cassette Use

For less expensive local production of interactive video, the only option is the video-cassette. Even prototypes of interactive videodisc materials are normally tested using the video-cassette and a microcomputer. The major limitations of the video-cassette format are longer search times (fast forward or rewind) than the videodisc format and problem of using the pause setting. The videodisc can access a single frame and display that frame for as long as needed. A video-cassette recorder using the "pause" control to display a frame will cause the videotape to deteriorate at that point.

Another problem is exact frame accessibility. If a videodisc program calls for frame 1000, then you can expect frame 1000 to be displayed. A video-cassette may be off by several frames especially if the fast forward or rewind mode has been activated. Since there are 30 frames for each second of video playback time, this is not a serious drawback. Some manufacturers of interface boards (an electronic circuit board that plugs into the microcomputer and connects by cables to the video-cassette player) claim absolute frame accuracy. In any case, experience shows that about 2 to 3 seconds of fade in/fade out or 2 or 3 seconds of green screen should precede and follow each accessible video segment. Graphics and other "stills" that could be accessed as a single frame on a videodisc should be recorded as a video segment for as long as needed rather than accessed by the "pause" control. The video-cassette has the obvious advantage of allowing longer playback time than the videodisc at normal playback speed. This advantage can offset the problem of trying to access single frames.

A video-cassette controller such as Sony's Videoresponder System or the Panasonic equivalent can be used to access edited portions of a videotape depending upon student answers to multiple-choice questions. A videotape segment can be played or skipped over or a remedial segment can be played.

For more complex branching and for simulation (showing a different videotaped outcome for each of several choices in a decision-making situation), a microcomputer is needed along with an interface board to connect the microcomputer and the video-cassette player.

Computer Software for Authoring Interactive Video

In addition to all of the hardware and the videotaped segments, appropriate computer software is needed to display the questions to be asked or decisions to be made. The computer software also assures that the proper video segments are displayed depending upon the answers given or the choices made. For those with limited experience at computer programming, an authoring package requiring no computer language skills is a must.

One type of authoring package allows the producer to label each video segment by number and to define the beginning and end of each segment by pressing the proper key on the computer keyboard as the video-cassette is played with the computer in the authoring mode. A similar process is used for labeling each "text screen". A text screen consists of the question frame or other information typed with the computer keyboard. The resulting printed information is viewed as a single frame on the monitor. The authoring program then allows the producer to specify by number the text screen or video segment to display as a result of each answer or choice made by the student.

Another type of authoring system allows the producer to specify each video segment by the beginning and ending frame number. Still another uses one of the audio tracks as a control track.

An authoring package is necessarily limited. For example, one cannot ordinarily mix short drill and practice game sequences or computer graphics routines with the text screens and video segments. However, it is possible to lift out sub-routines from

the typical authoring package as well as the associated machine language and text files and use them as part of a locally-designed program. A fairly high level of programming skill is required.

Apple Superpilot, which is a course authoring language rather than a package requiring no language skills also has built-in routines for video control. The language is very flexible for designing computer-assisted instructional sequences. However, the video control sub-routines may not be compatible with some interface boards. At the present time, there is almost no compatibility among various interfaces and authoring packages from different manufacturers.

Flowcharting and Other Special Production Requirements

Designing and producing an interactive video program requires some special considerations in planning. In addition to the usual script and storyboard, it pays to develop a complete flowchart including all possible branches and decisions available to the student. The flowchart should indicate exactly which video segment or segments and which computer text screens will be shown to a student based on each response to a question or decision. It should also indicate what is to occur after viewing the video segment or text screen. With multiple branches and simulation sequences, the possibilities and permutations and therefore the flowchart can become fairly complex. The article by Dargan on interactive video flowcharting should be helpful to the reader in developing flowcharts.

Flowcharting not only allows the designer and producer to see the whole picture and curtail the possibility of dead-end branches, it also allows for easy spotting of long search times prior to video production. For example, if a response to a decision or question near the end of a videotape requires the cassette to rewind to locate a video segment near the beginning of the tape, a long rewind time will delay instruction. It would be better in such a case to simply duplicate the particular video segment, especially if it is short, near the most currently-used location on the video tape. With careful planning and editing, fast forward and rewind search time can be kept to a minimum.

At the present state of the art, it is not feasible to "overlay" computer text on top of video material. Both the video and typed computer text cannot be viewed at the same time because the signal generated by most microcomputers is not a standard (NTSC) television signal. Special adapters are available which can make the signals from the video recorder and computer compatible but these may cost more than the computer itself.

If sophisticated text and graphics are desired, it may be cheaper to replace the decision and question frames with high-quality video graphics on the videotape itself, thus enabling the student to make a response while the videotape is still rolling. After the student response is detected, the computer can shift to a text screen for feedback. The feedback text screen might say something like, "You chose answer B. Let's see if you are correct". The text screen is shown while the video-cassette deck searches for the next appropriate video segment which follows immediately afterwards. Most interfaces will allow such input to the computer while a video segment is being played although the more limited authoring packages may not allow this.

Planning Considerations

Interactive video, like other instructional media, requires a great deal of planning, design time, creativity, and finances for quality results. Before proceeding, the designer and producer should obviously already have answered questions such as: . . . How long will the subject matter content remain stable? . . . Is self-instruction the most appropriate and effective mode for the kinds of learning and competencies to be achieved? . . . Can sufficient numbers of students be instructed to justify the cost?

Currently, because of cost and non-compatible systems, interactive video is still largely an experimental method of instruction in public and higher education settings. In the future, significant price reductions and greater compatibility in equipment should increase the utilization greatly although most applications will probably continue to be found in training and industrial settings.

More Information

For more information, several special journal issues, each containing a number of articles on various aspects of interactive video, are listed in the bibliography. The reader may also wish to contact this author for specifics on the kinds of equipment and authoring packages currently being used as well as to share other information and experiences.

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BIBLIOGRAPHY — Selected articles from three topical journal issues.

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Ciarcia, Steve., "Build an Interactive-Videodisc Controller", p. 60

Daynes, Rod., "The Videodisc Interfacing Primer; Learn What it Takes to Develop Interactive Videodisc Programs", p. 48

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_____, "Authoring, Simulation, and Computers", p. 69

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L'Allier, James J., "Some Basic Questions About Interactive Video", p. 30

Levy, Martin., "A New Authoring Language", p. 31

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_____, "Directory of Interactive Video Systems, Controls, Interfaces, Computers, and Video Program Producers", p. 35

A GLOSSARY OF COMPUTER TERMS

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ALGORITHM
A step-by-step set of directions guaranteed to solve a particular type of problem in a finite number of operations.

ARTIFICIAL INTELLIGENCE (AI)
The branch of computer science that deals with questions such as "How smart is a computer?"

ASSEMBLER
A program that translates assembly language into the computer's native language.

BASIC
An acronym for Beginner All-Purpose Symbolic Instruction Code.

BATCH PROCESSING
An approach to data processing where a number of similar input items are grouped for processing during the same machine run.

BINARY DIGIT (BIT)
One of the symbols O or 1. The binary number system uses just these digits to represent numbers.

BUG
An error - either a programming error or equipment malfunction.

BYTE
The computer space needed to store one character (a letter, symbol, number, etc.).

CALCULATOR
An electronic digital machine designed to carry out arithmetic operations such as addition, subtraction, multiplication and division.

CATHODE-RAY TUBE (CRT)
Similar in appearance to a television screen.

CENTRAL PROCESSING UNIT (CPU)
Controls what the computer does.

CHIP
The heart of a microcomputer on which thousands of electronic elements are implanted.

COMMAND
A request to the computer that is executed as soon as it has been received.

COMPUTER ASSISTED INSTRUCTION (CAI)
The use of a computer to help present instruction, to help teach students.

COMPUTER AUGMENTED LEARNING (CAL)
The use of problem-solving programs from a software library as an aid to student learning. Often the programs being used are similar or identical to those used to solve real world problems from business, science and industry.

COMPUTER LITERACY
A knowledge of the capabilities, limitations, applications and possible effects of computers.

COMPUTER MANAGED INSTRUCTION (CMD)
The use of computers as a record keeper, diagnostic tester, prescriber of what to study next, and so on.

COMPUTERS IN EDUCATION
This field is often divided into administrative uses, instructional uses and research uses.

COURSEWARE
A combination of software, print materials and other aids for the student and teacher.

DATA
Information of any kind.

DEBUGGING
Finding errors and correcting them.

DISK
A record-like magnetic-coded piece of material (5" or 8") that can store programs, data, or tables of information.

DISK DRIVE
A peripheral that can store and retrieve information from a disc.

DISK OPERATING SYSTEM (DOS)
An operating system which includes the capability of controlling and coordinating the functions of a disk drive within a computer system.

EDITING
Making corrections or changes in a program or data.

FLOPPY DISC
A soft plastic disk, about the size of a 45 rpm record, on which information can be recorded using a drive disk.

FORMAT
To specify the form in which something is to appear.

GRAPHICS
Images displayed on a video screen or printer which are generated by a computer program.

HARDCOPY
Data or information printed on paper as distinguished from printed information on the computer's screen.

HARDWARE
Equipment, including computers, disk drives, cassette players, cables, monitors.

INSTRUCTIONAL COMPUTING
The field of instructional use of computers is often divided into three parts; teaching using computers, teaching about computers, and the study of the impact of computers upon the current curriculum.

INTERACTIVE COMPUTING
Said of a computer system that responds to the user quickly - usually less than a second for a typical action. All personal computer systems are interactive.

INTERFACE
Electronic circuit that connects the CPU and peripheral device (disc drive, etc.) permitting the flow of data back and forth.

K
The amount of available memory is described in KILOBYTES (K), such as "16K" meaning a computer can store (save) roughly 16,000 characters of information.

LANGUAGE
A code used by a programmer to communicate effectively with a computer so that the machine will perform specific tasks on demand.

LOGO
A language specifically developed for helping students to write their own programs.

MEMORY
The circuit within computer systems where information and programs are stored.

MICRO
A microcomputer.

MICROCOMPUTER
A computer based on a microprocessor.

MICROPROCESSOR
An integrated circuit that performs the task of executing instructions.

MICROSECOND
A millionth of a second.

MODEM
An abbreviation of MOdulator-DEModulator. A device that allows information to pass from one computer to another over telephone lines.

MONITOR
A television set used to display text.

NANOSECOND
A billionth of a second.

OPERATING SYSTEM
A program or set of programs which controls and coordinates the operations of the components of a computer system.

OUTPUT
Information leaving a device or process. For example the output from a computer can be displayed by a printer or CRT.

PACKAGE
One or more computer programs with related materials and the storage medium. A package represents a microcomputer application.

PERIPHERAL
An add-on device that can send information to and/or receive information from a computer. Examples: printers, modems, disk drives, terminals, etc.

PRINTER
A peripheral that makes hard copy of letters and numerals.

PROGRAM
A series of instructions that a computer follows to solve a problem or perform a task.

PROGRAMMING LANGUAGE
Each computer is constructed to be able to follow (execute) a program written in its "machine language." There are a number of more universal high-level com-

puter languages that people have developed such as BASIC, COBOL, LOGO, FORTRAN, PILOT and Pascal.

RANDOM ACCESS MEMORY (RAM)
An acronym. This is the space "in-the-machine" available for storage and which can be accessed in random sequence. RAM can be erased and reprogrammed by the user as frequently as necessary.

READ ONLY MEMORY (ROM)
Acronym. This is a kind of memory in which the information is stored once, usually by the manufacturer, and cannot be changed.

SCROLL
To move all the text on the screen (usually upwards) to make room for more text.

SOFTWARE
Computer programs, including application programs, operating systems and languages.

STATEMENT
see Command

STORAGE MEDIUM
Tape cassette, flexible disk, ROM cartridge or RAM for storing micro-computer programs.

TERMINAL
A peripheral consisting of a keyboard through which a person can send information to the computer and printer or screen through which the computer can present information to the person.

TIMESHARED COMPUTING
A form of interactive computing in which a number of terminals are connected to a single computer system and share its resources.

WORD PROCESSING
Use of a computer as an automated typewriter.

SELECTED REFERENCES ABOUT MICROCOMPUTERS

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This highly selective bibliography was originally compiled for "Microcomputers/Macro Concepts: Educational Crossroads for the 80's," the 24th Annual Kent State University Library/Media Workshop held on April 24, 1982. However, it has been extensively updated and is current as of March 1, 1983.

As microcomputers become commonplace in both libraries and schools, more and more references to them are found in the published literature. In fact, books and periodicals devoted solely to the educational uses of microcomputers are now readily available. Consequently, any bibliography on this topic quickly becomes dated. It is the intent of this selective bibliography to identify certain significant articles and books and to demonstrate the wide variety of topics and sources available. Brief annotations are included for most entries.

This bibliography is divided into the following sections:

I. Microcomputers—An Introduction
II. Microcomputers in the Library
III. Microcomputers in Education
IV. Microcomputers & Software—Directories and Purchasing Guides
V. Selected Journals and Periodicals
VI. Indexes and Abstracts

I. MICROCOMPUTERS—AN INTRODUCTION

Blair, John C., Jr. "Micros, Minis and Mainframes . . . A Newcomer's Guide to the World of Computers—Especially Micros." **Online** 6 (January 1982): 14-26.

Generally describes various types of computers, but emphasizes applications of microcomputers. Includes brief glossary and bibliography.

Dagless, Erik L. and David Aspinall. **Introduction to Microcomputers.** Rockville, MD: Computer Science Press, 1982.

Presents general overview of microcomputers and includes many flowcharts, tables and illustrations.

Dirksen, A. J. **Microcomputers: What They Are and How to Put Them to Productive Use.** Blue Ridge Summit, PA: Tab Books, Inc., 1982.

Emphasizes the multiplicity of uses of microcomputers. Some technical aspects of their operation are explained.

Heller, Rachelle and C. Dianne Martin. **Bits 'n Bytes About Computing: A Computer Literacy Primer.** Rockville, MD: Computer Science Press, 1982.

Describes basic computer operations and includes educational objectives and activities for each chapter. Written for elementary school teachers with minimal computer background.

Holtzman, Charles P. **What To Do When You Get Your Hands on a Microcomputer.** Blue Ridge Summit, PA: Tab Books, Inc., 1982.

Presents brief overview of computers, but is primarily concerned with teaching the beginning programmer to use the BASIC language.

Osborne, Adam. **An Introduction to Microcomputers. Volume 0—The Beginner's Book.** 3rd ed. Berkeley, CA: Osborne & Associates, 1979.

Provides a detailed description of all aspects of microcomputers with special emphasis on their "functional capabilities."

Papert, Seymour. **Mindstorms: Children, Computers, and Powerful Ideas.** New York: Basic Books, 1980.

Excellent, thought-provoking book, often referred to in the literature.

Seidel, Robert J. **Computer Literacy.** New York: Academic Press, 1982.

Includes papers and conference reports dealing with the broad topic of "computer literacy" from the National Goals for Computer Literacy in 1985.

Souviney, Randall. "There's a Microcomputer in Your Future." **Teacher** 97 (February 1980): 53-58.

Presents an easy-to-understand explanation of microcomputers and describes how they can be used in education.

Waite, Mitchell and Michael Pardee. **Microcomputer Primer.** Indianapolis, IN: Bobbs-Merrill Educational Publishing Co., 1980.

Introduces novice users of microcomputers to the more technical aspects of their operation.

Willis, Jerry and William Danley, Jr. **Nailing Jelly to a Tree.** Beaverton, OR: dilithium Press, 1981.

Introduces the nonprogrammer to BASIC and assembly language programming and describes various types of software available.

II. MICROCOMPUTERS IN THE LIBRARY OR MEDIA CENTER

Anderson, Eric S. "The Microcomputer: One More Piece of AV Equipment." **The Book Report** 2 (September-October 1982): 28-32.

A general article for media specialists on selecting hardware and software for the school media center.

Barrette, Pierre P. "Microcomputers in the School Media Program." **Catholic Library World** 53 (October 1981): 125-132.

Describes the impact microcomputers will have on school media programs, both on a local and a national level.

Carl, David L. "Library Media Specialists and Instructional Development: A Probe of the Literature via Microcomputer." **School Library Media Quarterly** 10 (Winter 1982): 158-163.

Demonstrates how a microcomputer could be used to record and analyze data from various research studies in school librarianship.

Christian, Deborah. "The Microcomputer at Oakridge, Oregon." **Library Journal** 105 (July 1980): 1470-1471.

Summarizes briefly an automated circulation system which uses a microcomputer that has been implemented at a small public library.

Costa, Betty. "Microcomputer in Colorado—It's Elementary." **Wilson Library Bulletin** 55 (May 1981): 676-678.

Demonstrates how a microcomputer is used to provide subject, author and title access to a school library's collection.

Costa, Betty. "An Online Catalog for an Elementary School Library Media Center." **School Library Media Quarterly** 10 (Summer 1982): 337-340+.

Describes "Computer Cat," the microcomputer-based online catalog system used in a elementary school media center in Colorado.

Fosdick, Howard. "The Microcomputer Revolution." **Library Journal** 105 (July 1980): 1467-1472.

Emphasizes the tremendous impact microcomputers will have on all types of library automation and on all sizes of libraries.

Grookett, Paula R. "Introducing the Media Specialist to the Microcomputer." **The Book Report** 2 (September-October 1982): 25-27.

A successful in-service program for media specialists in South Carolina.

Jones, Maxine. "Computer Resources for the School Librarian." **American Libraries.** 13 (April 1982): 276-277.

Brief description of various computer applications available for school librarians.

Jones, Milbrey L. and Beatrice Simmons. "Utilizing the New Technologies in School Library Media Centers: A Report to the Association." **School Media Quarterly** 9 (Summer 1981): 231-234.

Includes a discussion of microcomputers and lists guidelines for selecting software and sources of additional information.

Krueger, Donald R. "Issues and Applications of Microcomputers for Libraries." **Canadian Library Journal** 38 (October 1981): 281-285.

Details problems of using microcomputers in libraries and presents possible solutions. Includes bibliography.

Lopez, Antonio M., Jr. "Microcomputers: Tools of the Present and the Future." **School Media Quarterly** 9 (Spring 1981): 164-167.

Identifies commercially available microcomputer systems and briefly deals with the role of microcomputers in education and libraries.

Lundeen, Gerald. "The Role of Microcomputers in Libraries." **Wilson Library Bulletin** 55 (November 1980): 178-185.

Examines the actual and potential applications of microcomputers in libraries, both in technical services and public services.

Malsam, Margaret. "A Computer First for an Elementary School: Microcomputer Replaces Card Catalog." **Educational Computer Magazine** 1 (September/October 1981): 40-41.

Notes the use of a microcomputer as an online catalog in a school library. Includes examples of search requests and sample displays.

Mandell, Phyllis L. "Computer Literacy, Languages, and Careers." **School Library Journal** 28 (April 1982): 19-22.

Describes audio visual programs which explain how computers function. Annotations are provided by the distributors.

Moskowitz, Mickey. "Developing a Microcomputer to Evaluate Library Instruction." **School Library Media Quarterly** 10 (Summer 1982): 351-356.

Summarizes the development of a microcomputer program to evaluate high school library instruction programs. A sample program is included and outlined in a flowchart.

Nicklin, R. C. and John Tashner. "Micros in the Library Media Center?" **School Media Quarterly** 9 (Spring 1981): 168-181.

Examines the factors involved in determining the placement, applications, and management of microcomputers in a library media center.

Pratt, Allan D. "The Use of Microcomputers in Libraries." **Journal of Library Automation** 13 (March 1980): 7-17.

Considers using microcomputers as word processors, in the preparation of local information sources, and as a potential improvement in online searching.

Sherouse, Vicki. "For Your Reference: Support for Your Local Computer Revolution." **The Book Report** 2 (September-October 1982): 40-42.

A guide to software programs, periodicals, and support groups for the media specialist who has just gotten his first microcomputer.

Skapura, Robert. "The Overdue Writer: A Program Long Overdue." **School Library Media Quarterly** 10 (Summer 1982): 347-350.

Demonstrates how a microcomputer can be used not only to handle circulation records in a high school library, but also how it can generate overdue notices.

Skoman, Lucia. "Organizing a Software Collection." **Classroom Computer News** 2 (September-October 1981): 36-37.

Describes a seven-digit numbering system which can be used to organize a collection of software. The number identifies type of material (disk or cassette), shelf location, and type of microcomputer it can be used on.

Thomason, Nevada. "Microcomputers and Automation in the School Library Media Center." **School Library Media Quarterly** 10 (Summer 1982): 312-319.

Presents a summary of the various uses for microcomputers in school libraries. Includes a glossary and a bibliography.

III. MICROCOMPUTERS IN EDUCATION

Arnold, Anne Jurmu. "Getting That Computer Into Your School." **Learning** 11 (October 1982): 46+.

Suggests ways to secure grants to purchase microcomputers and discusses the possibility of obtaining free computers.

Baker, Frank B. "Computers and the Classroom." **New York University Education Quarterly** 9 (Summer 1978): 13-19.

Believes that most discussions of microcomputers and education have emphasized technological rather than educational issues.

Barrette, Pierre, ed. **Microcomputers in K-12 Education.** Rockville, MD: Computer Science Press, 1982.

Includes twenty-one papers presented at the First Annual Conference of Microcomputers in K-12 Education which was held at Southern Illinois University on March 19-20, 1981. Emphasis is on practical applications of microcomputers in schools.

Billings, Karen and David Moursund. **Are You Computer Literate?** Beaverton, OR: dilithium Press, 1979.

Incorporates descriptions of the applications and limitations of microcomputers into a manual which can also be used as a self instruction guide. Includes questions at the end of each chapter and a final examination.

Bitter, Gary. "Keeping Up with Computers." **Instructor** "(January 1982): 108-109.

Presents a bibliography of books and magazines to help teachers and students learn about computers.

Caldwell, Robert M. "Guidelines for Developing Basic Skills Instructional Materials for Use with Microcomputer Technology." **Educational Technology** 20 (October 1980): 7-12.

Suggests ways for preparing successful instructional programs using microcomputers.

Cicciarella, Charles. "Test Writer." **Classroom Computer News** 2 (March-April 1982): 36-37.

Presents a program written to produce multiple-choice tests from a master list of questions input by the author of the test. The program is written in Applesoft BASIC and is run on a Apple II Plus computer.

"Computers in Education." **NASSP Bulletin** 66 (September 1982): 1-98.

Features seventeen brief articles on all aspects of microcomputers in the

classroom. Topics range from buying hardware to achieving computer literacy.

"Computers in the Schools: What's Really Happening Around the Country." **Learning** 11 (October 1982): 30-31+.

Identifies the extent of availability and use of microcomputers in schools in five states. Considers the extent to which computers aid learning.

Cunningham, Sandra. "Off to a Good Start With Microcomputers." **Educational Computer** 1 (September-October 1981): 38-39.

Analyzes the effects microcomputers had on both curriculum and instruction in an Illinois school system.

Feltman, Charles. "Local Networks." **Popular Computing** 2 (April 1983): 115-123.

An overview of the two types of networks systems available, star and bus, plus the pros and cons of each. Also, how to figure cost savings when compared to separate systems and a run down of brands.

Gottfried, Phyllis. "Microcomputers in Education: Suggestions for a Shared Approach." **The Computing Teacher** 7 (November 1981): 52-54.

Stresses the need for teachers to be "computer literate" and suggests some criteria for setting up a computer center.

Hinton, John R. "Individualized Learning Using Microcomputer CAI." Aptos, CA: Cabillo College, 1980. ERIC ED 196 409.

Reviews the literature on the use of microcomputers in individualized learning entered into the ERIC system between November 1978 and October 1979.

Johnson, Jo Rykken. "Making the Transition to Computers Easy." **Educational Computer** 1 (July-August 1981): 16-19.

Outlines an inservice program in computer literacy for elementary school teachers.

Joiner, Lee Marvin; Burton J. Silverstein; and Jay Dee Ross. "Insights from a Microcomputer Center in a Rural School District." **Educational Technology** 20 (May 1980): 36-40.

Describes how a school district in Ortonville, Minnesota chose a microcomputer and staffed a computer center.

Joiner, Lee Marvin; George Vensel; J. D. Ross; and Burton Silverstein. **Microcomputers in Education: A Nontechnical Guide to Instructional and School Management Applications.** Holmes Beach, FL: Learning Publications, Inc., 1982.

Offers a basic outline for implementing a microcomputer center. Fourteen appendices provide lists of vendors, publications, and a glossary.

LaShier, William S., Jr. "A Scan of Microcomputer Journals." **Science Teacher** 48 (November 1981): 43-47.

Annotates a selective list of journals that deal regularly with the educational uses of microcomputers. Emphasis is on journals of interest to science and mathematics teachers.

Leimbach, Judy. "Spotlight on Computers: Students in Control." **School Library Journal** 28 (August 1982): 37.

Describes a program at Briar Glen School in Glen Ellyn, Illinois, in which academically gifted fifth graders use microcomputers and develop their own programs.

Lieberman, Michael and others. **Computers Don't Byte. A Starting Point for Teachers Using Computers: A Resource Booklet.** Toronto: Ontario Secondary School-teachers' Foundation, 1981. ERIC ED 213 396.

Includes general explanations of computer technology and discussions of the uses of microcomputers by teachers.

McClain, Larry. "A Friendly Introduction to Videodiscs." **Popular Computing** 2 (April 1983): 78-87.

A beginner's guide to videodiscs and their use with microcomputers. Included are discussions of types of systems, applications, and interfaces.

Murphy, Edward. "Developing Computer Literacy in K-12 Education." **The Computing Teacher** 7 (November 1981): 43-48.

Presents suggestions for introducing teachers and students to computers and programming.

National Education Association. **Computers in the Classroom.** Washington, DC: NEA, 1982. Henry S. Kepner, Jr., ed.

Includes sixteen articles dealing with the selection and implementation of microcomputers in various educational settings. Examples of successful uses of microcomputers are also presented.

Newton, David J. and others. **How to Run a Computer and Keep Up with It. A Co-Ser Project.** Cortland, NY: Cortland-Madison Board of Cooperative Educational Services, 1981. ERIC ED 211 073.

Provides a variety of curriculum materials for teachers of grades six through nine which introduce basic computer applications and programming in BASIC. Suggested handouts and quizzes are also included.

Patton, Robert and others. **Computer Literacy for All High School Students.** May 1981. ERIC ED 216 679.

Details a two-week computer literacy unit presented in geometry classes. Computer awareness among adults in the community is also a goal of this high school located in Wisconsin.

"Special Section": The Effects of the Coming of the Computer Age. **Phi Delta Kappa** 63 (January 1983): 303-325.

Contains nine articles which deal with both philosophical (e.g. "The Silicon Age and Education") and practical (e.g. "The Computer in the School: A Case Study") issues.

Swigger, Kathleen and James Campbell. "The Computer Goes to Nursery School." **Educational Computer** 1 (July-August 1981): 10-12.

Details how a microcomputer is used to teach reading readiness skills to preschool children at the North Texas University Nursery School.

Thomas, James L. **Microcomputers in the Schools.** Phoenix, AZ: Oryx Press, 1981.

Represents a collection of twenty-five published articles on the current and potential uses of microcomputers in schools. Includes various appendices, a glossary, and an extensive bibliography.

Van Diver, Gerald and Rolland Love. **Educators Handbook and Software Directory for Microcomputers.** Overland Park, KS: Vital Information, Inc., 1982.

Includes over twenty brief articles of interest to educators setting up a computer center. A list of software vendors is provided that indicates which microcomputer (Apple, Atari, PET, or TRS/80) their programs will run on.

Wrege, Rachael and Dan Watt. "Forum on Educational Computing." **Popular Computing** 2 (November 1982): 132-134+.

Reports on a discussion which took place at the National Educational Computing Conference between educators and computer scientists about educational uses of computers.

IV. MICROCOMPUTERS: HARDWARE & SOFTWARE DIRECTORIES & PURCHASING GUIDES

Barrette, Pierre P. "Selecting Digital Electronic Knowledge: A Process Model." **School Library Media Quarterly** 10 (Summer 1982): 320-336.

Offers suggestions for evaluating and selecting instructional software. Guidelines are for school librarians or media specialists.

Classroom Computer News Directory of Educational Computing Resources, 1983. Watertown, MA: Intentional Educations, Inc., 1982. (First of a proposed annual directory.)

Lists items in the following categories: 1) software directories; 2) user groups; 3) ongoing projects; 4) databases; 5) associations; and 6) agencies. Written by the editors of **Classroom Computer News.**

Cohen, Vicki L. Blum. **Evaluating Instructional Software for the Microcomputer.** Paper presented at the Annual Meeting of the American Educational Research Association. March 1982. ERIC ED 216 704.

Attempts to define the criteria that should be used in evaluating instructional microcomputer software. Reports on a systematic study conducted of this problem by the Educational Microcomputer Resource Center at Columbia University.

Deacon, Jim. "If I Had an Apple, What Would I Do with It?" **Educational Computer Magazine** 1 (September/October 1981): 15+.

Details why an Apple computer was selected for use in a school media center.

Gordon, Anitra and Karl Zinn. "Microcomputer Software Considerations." **School Library Journal** 28 (August 1982): 25-27.

Discusses the various factors a school media specialist must consider when selecting instructional software. Includes a list of recommended journals.

Graham, John and Roy Wyland, ed. **International Microcomputer Software Directory.** Ft. Collins, CO: Imprint Software Ltd., 1982.

Provides a comprehensive list of microcomputer software. Over 5,000 programs are identified.

Huntington, John F. "Computer Comments: Which Computer System." **Educational Technology** 21 (December 1981): 29-30.

Identifies basic questions to ask when purchasing a microcomputer for educational purposes.

Microcomputer Directory: Applications in Educational Settings. Cambridge, MA: Monroe C. Gutman Library, Harvard Graduate School of Education, 1981. ERIC ED 211 117.

Lists microcomputer programs available for use in elementary and secondary schools.

School Microware: A Directory of Educational Software. Over 500 Programs/Packages for APPLE, PET, TRS-80. Dresden, ME: Dresden Associates, 1980.

Describes the software available from forty-five software suppliers. A wide variety of programs is included. Indexes are provided by educational level, individual microcomputer systems, and alphabetical listing of software suppliers.

School Microwave Reviews. Evaluations of Educational Software for APPLE, PET, TRS-80, With Index to Evaluations in Other Publications. Dresden, ME: Dresden Associates, 1981.

Evaluates fifty examples of instructional software. An index to software reviews published in other magazines is also included.

Smith, Richard A. and Marion Spokony. "Selecting and Evaluating a Computer System: A Guide for Educators." **Electronic Education** 1 (March-April 1982): 7-9.

Offers a series of questions which should be answered when selecting and evaluating computer software.

Wade, T.E., Jr. "Evaluating Computer Instructional Programs and Other Teaching Units." **Educational Technology** 20 (November 1980): 32-34.

Describes what to look for when purchasing microcomputer software.

Watt, Dan. "Which Computer Should a School Buy?" **Popular Computing** 2 (December 1982): 140-144.

Discusses computer hardware commonly used in schools, including information on costs and special languages such as Logo.

Media & Methods

9 issues per year. American Society of Educators, 1511 Walnut Street, Philadelphia, PA 19102.

Basic journal dealing with all aspects of audiovisual materials. More and more attention is being given to both microcomputer hardware and software.

Personal Computing

Monthly. Hayden Publishing Co., 50 Essex Street, Rochelle Park, NJ 07662.

Offers relatively technical information about microcomputers, with particular emphasis on software and writing programs.

Popular Computing

Monthly. Box 590, Martinsville, NJ 08836 (subscription).

Serves as a general introduction to personal computers. Articles typically deal with particular microcomputers, e.g. Apple or TRS-80

Recreational Computing

Bi-monthly. P.O. Box E, 1263 El Camino Real, Menlo Park, CA 94025.

Written by and for computer hobbyists.

Softside: Your Basic Software Magazine

Monthly. 515 Abbot Drive, Broomall, PA 19008 (subscriptions)

Small Computers in Libraries

Monthly. Graduate Library School, University of Arizona, 1515 E. First Street, Tucson, AZ 85719.

Covers all aspects of library automation which can involve microcomputer systems. Primarily public and academic applications are considered in this newsletter.

V. SELECTED JOURNALS AND PERIODICALS

Apple Education News
3 issues per year. Apple Computer Inc., 10260 Bandley Drive, Cupertino, CA 95014.

Byte: The Small Systems Journal
Monthly. Byte Publications Inc., 70 Main Street, Peterborough, NH 03458.

Generally considered one of the best publications aimed at the users of microcomputers.

Classroom Computer News
Bi-monthly. Box 266, Cambridge, MA 02138.

Emphasizes practical applications.

The Computer Teacher
7 issues per year. c/o Computing Center, Eastern Oregon State College, LaGrande, OR 97850.

Concentrates on the instructional uses of microcomputers and calculators in schools.

Creative Computing
Monthly. P.O. Box 789-M, Morristown, NJ 07412.

Offers ideas and innovative uses for microcomputers. Designed more for the computer hobbyist.

The Digest of Software Reviews: Education
Quarterly. 1341 Bulldog Lane, Suite C, Fresno, CA 93710.

Profiles instructional programs and identifies reviews about them. First issue published in January 1983.

ERIC/IR Update
Semiannual. ERIC Clearinghouse on Information Resources, School of Education, Syracuse University, Syracuse, NY 13210.

Regularly includes news about educational and library uses of microcomputers. It is also free.

Educational Computer Magazine
Bi-monthly. P.O. Box 535, Cupertino, CA 95015.

Deals with all aspects of educational microcomputers. Many articles are written by teachers.

Educational Technology: The Magazine for Managers of Change in Education
Monthly. Educational Technology Publications, 140 Sylvan Ave., Englewood Cliffs, NJ 07632.

Covers a broad range of topics involving educational media and technology. (The October 1981 issue had the theme: "Computers in the School.")

Instructional Innovator
9 issues per year. Association for Educational Communication and Technology, 1126 16th Street NW, Washington, DC 20036.

Primarily concerned with audiovisual materials and media (formerly: **Audiovisual Instruction**).

VI. INDEXES AND BIBLIOGRAPHIES

Bibliographic control of the literature on microcomputers is improving, but in most cases searches of both education and computer indexes are required. ERIC remains the primary source for educational applications, while either **Computing Reviews** or **Computer Abstracts** can be searched for more technical topics.

However, three new online indexes should significantly improve access to microcomputer publications and software:

RICE (Resources in Computer Education)

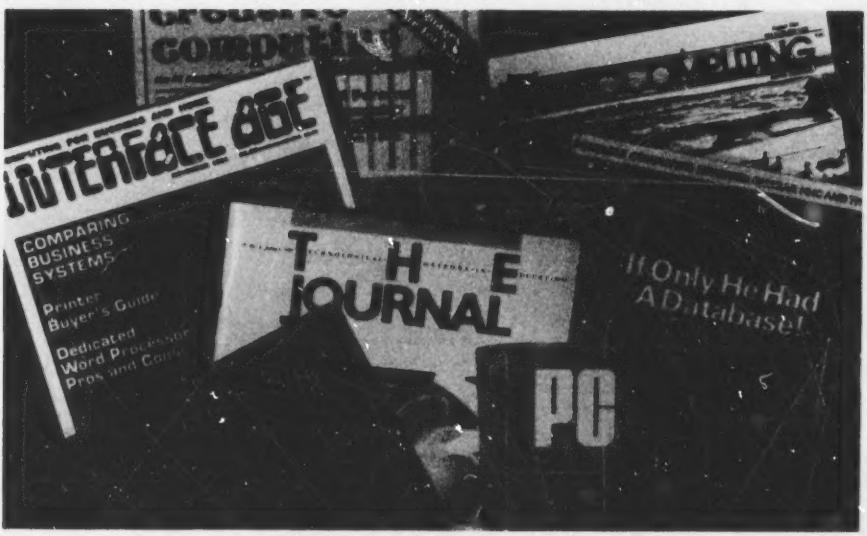
Developed by the Northwest Regional Educational Laboratory, this database offers individual descriptions of secondary education. It is part of the SPIN (School Practices Information Network) database available from BRS (Bibliographic Retrieval Services).

INTERNATIONAL SOFTWARE DATABASE

Includes approximately 10,000 references to computer software. Is not limited to microcomputers, but includes software for all types of computers. Available as File 232 on DIALOG Information Retrieval Service.

MICROCOMPUTER INDEX

Contains citations to articles, reviews, and product announcements about microcomputers found in over twenty-five microcomputer periodicals (including all of those listed in Section V above). Probably the most comprehensive index to references about microcomputers. Available as File 233 on DIALOG Information Retrieval Service.



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